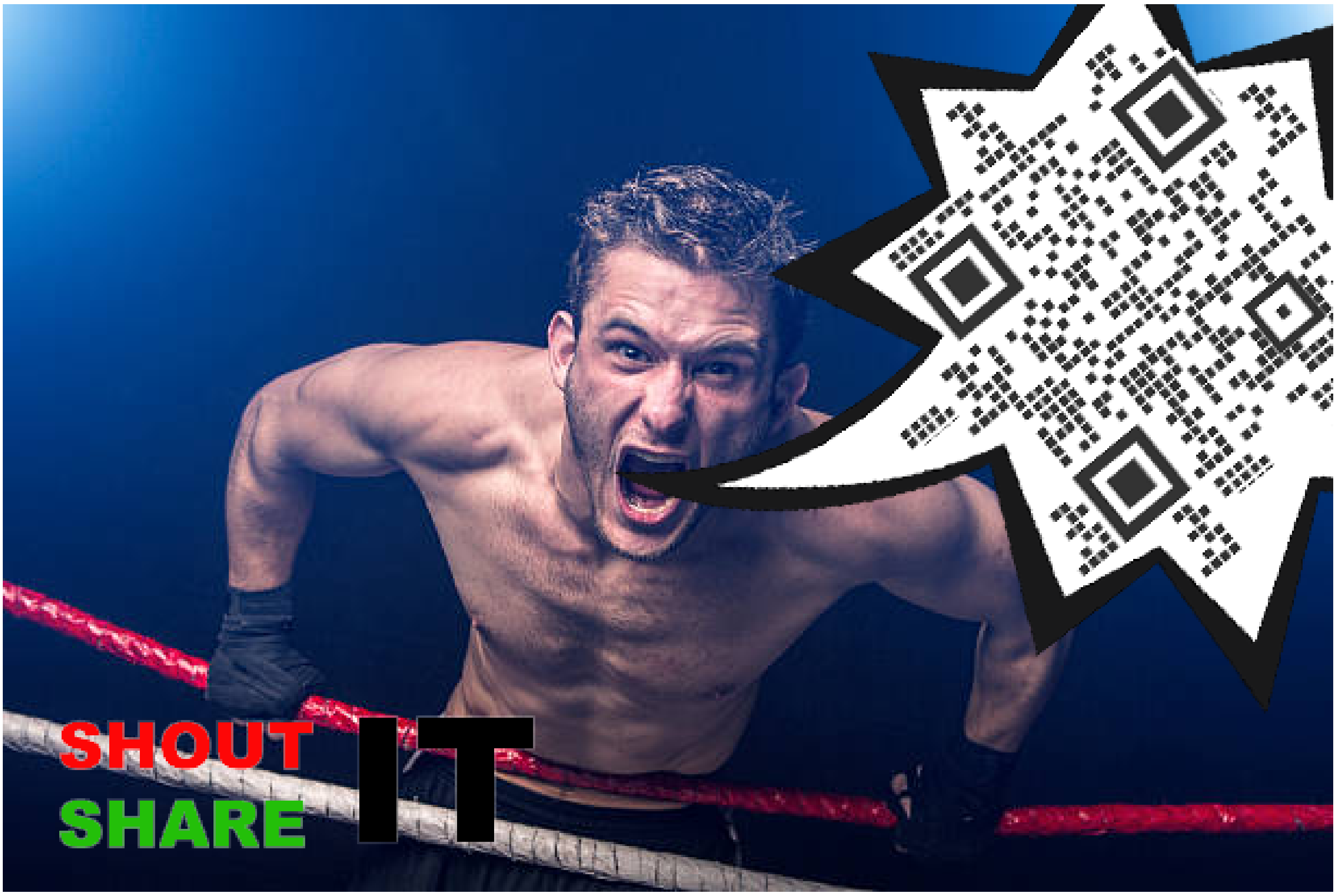
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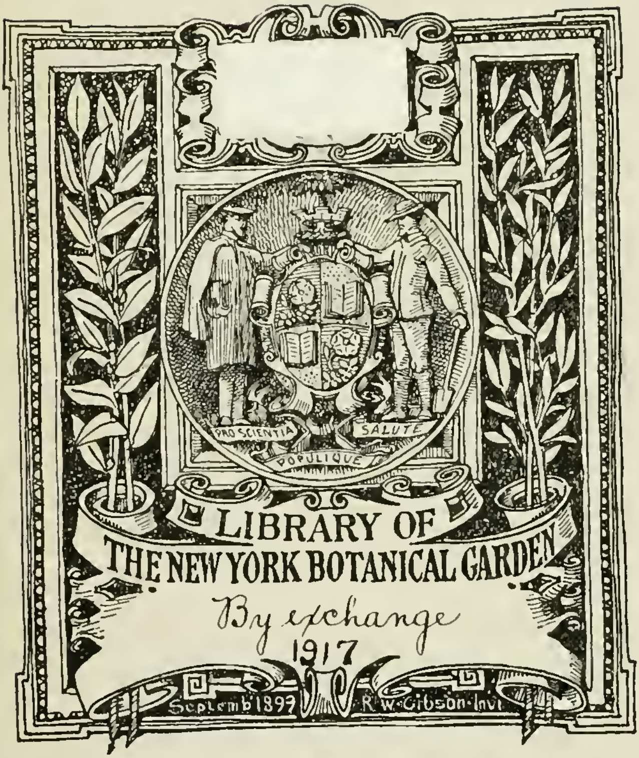
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VOLUME VI No. 1

THE MONTHLY BULLETIN

OF

STATE COMMISSION OF HORTICULTURE

SACRAMENTO, CALIFORNIA JANUARY, 1917

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THE MONTHLY BULLETIN.
CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VI. January, 1917. No. 1

HISTORY OF THE AVOCADO AND ITS VARIETIES IN CALIFORNIA WITH A CHECK LIST OF ALL NAMED VARIETIES.*

By IRA J. CONDIT, College of Agriculture, Berkeley, California.

The first reference to the introduction of avocado trees into California which we have been able to find is in the report of the visiting committee of the California State Agricultural Society for 1856. The committee visited the place of Dr. Thomas J. White near San Gabriel on September 4th, and reported as follows: "Dr. White has imported from Nicaragua a variety of choice tropical fruits including the Sapota, the Aguacate or butter fruit, and the Mango." With what success these plants were cultivated has not been learned.

The early history of the avocado in California is so well described by Dr. F. Franceschi that I wish to quote the following paragraphs from his pen:

> "Just like the above named Mexican fruit trees, also the Ahuacate was first planted at Santa Barbara, but many years later, that is, in 1871, when three plants were brought from Mexico by the late Judge R. B. Ord, who brought also the first cherimoyas. One of these trees died in infancy; the other two were very large and thrifty when I came to Santa Barbara twenty years ago. Both have unfortunately disappeared, the tallest and finest, bearing fruits of good quality, dying probably on account of the ground being too shallow and dry at the place called "Las Palmas," in the upper part of Montecito; the other, which was branched low and much spreading, with very small and poor fruits, located on De La Vina street, in Santa Barbara, was cut down some fourteen years ago to make room for a new building.
>
> "In 1892, when I lived in Los Angeles, there was only one good sized ahuacate in all that neighborhood, and precisely at the Jacob Miller place, where stands now beautiful Hollywood. This had been brought from Guatemala, towards 1880, I believe, together with many other rare and interesting trees, and is still extant and thriving. Seedlings from this tree are among the most promising among those which attract the attention of ahuacate growers in California.
>
> "At Los Angeles the first person to give an efficient impulse to the growing of ahuacates, as well as other kinds of tropical or semitropical fruits in the early nineties, was Mr. J. C. Harvey, a Canadian by birth, and during some years agent of the Standard Oil Company in southern California. It was Mr. Harvey who raised the very remarkable ahuacate trees now to be seen at Mrs. Buddington's place on College street, and in Elysian Park, together with a numberless host of choice and beautiful plants scattered all over the country.

---

*Address before the fourth semiannual meeting of the California Avocado Association, San Diego, October, 1916.

> "The first orchard of ahuacates ever planted in California was started by the late Kinton Stevens, along Palm avenue in Montecito. Mr. Stevens was an Englishman full of energy and enterprise, who had also been the first in California to issue a catalogue of tropical and semitropical plants. His orchard was set out in 1895 and comprised about 120 trees, all Mexican seedlings, which in a few years grew to considerable size. Most unfortunately Mr. Stevens died in 1897, and then a series of dry years came on when water was very scarce in Montecito, and a great acreage of lemons was grubbed out, as absolutely unprofitable, and alas! the pioneer ahuacate orchard of California had to share their unlucky fate.
>
> "The 'White' ahuacate, to be seen on West Arrellaga street, Santa Barbara, which has proved to be such a prolific bearer, was raised by me from Mexican seed in 1895. A few grafted plants and a large number of seedlings from this tree were distributed under the name of 'Santa Barbara Early.'
>
> "It was also about 1895 that I obtained from Chile a few seeds of 'Paltita,' as a very hardy form or variety is called there, with small fruits, but of good quality. Most of the plants I raised went abroad, and in this country I know of only one large specimen, on the Nordhoff place at Redlands, which has proved to be much hardier than any other."

Judging from this account by Dr. Franceschi it appears that the older trees planted in Santa Barbara have passed out of existence and that the White tree which he raised in 1895 is the oldest in that city.

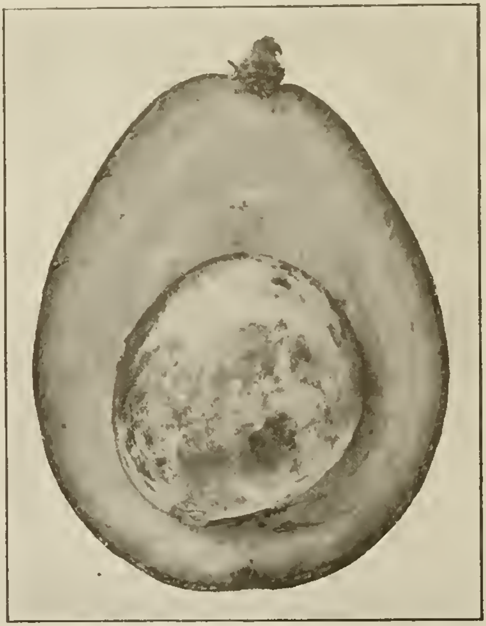

FIG. 1.—The Beauty is the latest of all of C. P. Taft's varieties to mature, coming from June to October. (Photo by Division of Citriculture, U. of C., Berkeley.)

The tree on the Jacob Miller place, Hollywood, to which reference is made, is probably the Miller, but the year 1886 is now commonly accepted as the date when the tree was planted. This seems to make the Miller tree the oldest by several years of any avocado tree in California. The Chappelow tree was planted in 1893, and the White in 1895.

In 1897 Dr. Franceschi wrote that the last two years had seen a considerable increase in the plantings, several hundred trees having been set out chiefly at Santa Barbara, Los Angeles and San Diego. Fruits were not exactly marketed but many more people, residents and tourists, had opportunity of tasting the delicious fruit.

Mr. C. P. Taft of Orange planted the first avocado seed on his place about 1899 from a specimen obtained on the market. The resulting tree proved a poor bearer of almost worthless fruit. The next year another seed obtained in the same way was planted and later the seedling bore excellent fruits. In 1902–3 more seeds were planted; these were partly from Los Angeles trees, but most were from Mexican fruit sent to private parties in Los Angeles. From the seeds planted during the four years, he had in 1912 thirty trees over eight years old in addition to over 300 younger trees. Twenty-four of the thirty trees had borne fruit and only one or two seemed likely to prove unprofitable. Eight were of the thin-skinned type, while the others were of the thick-skinned.

In the spring of 1908, Mr. E. S. Thacher planted his first avocado trees at Nordhoff. Most of them were bought from the Exotic nurseries of Santa Barbara, but some were obtained from Mr. Taft and Mr. Camfield of Orange. The same spring he bought some seed from the American Fruit and Produce Company of Mexico City, and it was from this lot of seed that trees were sold to W. G. Davison of La Habra in 1910. All of the first seeds planted by Mr. Thacher were of the Mexican thin-skinned type.

The trees planted by Mr. Davison grew thriftly in the location selected at "Orchard Dale" near Whittier and La Habra, a region that had always been practically frostless until the winter of 1912–13, when they were severely frosted. Mrs. Davison did not care to replace the trees that were most damaged and sold the entire lot to D. E. Clower, who moved them to his nursery in Monrovia. Mr. Clower budded ten thousand seedling avocado trees as early as 1909. In 1910 Mr. Clower published what was probably the first descriptive nursery pamphlet of budded trees in California.

Mr. F. O. Popenoe of the West India Gardens, Altadena, began propagating the avocado a number of years ago and, realizing the need of good varieties, imported budwood from Mexico in 1911 and 1912. The first lot of buds was sent by J. M. Goulding, now living at Paso Robles. Afterwards Mr. C. B. Schmidt was sent down to collect budwood, and more trees were propagated from the buds he secured than from the others. Later, budwood was secured from parties in Mexico, namely, Roberto Johnson of Jalisco and F. S. Furnival of Guadalajara. Twenty-seven varieties in all were successfully established here from these introductions.

Mr. W. A. Spinks of Duarte began planting avocado trees about 1907 and produced budded trees in 1908. He has tested out a large number of seedlings as well as budded trees of California and imported varieties.

The fruiting habits of such varieties as the Buddington, Murrietta, Colorado, Ferry, Harman, Ganter, Chappelow, and others were ascertained by Mr. Spinks by budding them into larger seedlings.

Mr. Sexton of Goleta planted out a few avocado trees several years ago and has since gathered together a large number of varieties for testing under similar conditions. In 1916 he had about 92 distinct varieties, representing types from Mexico, Guatemala, Florida, and Hawaii, as well as from California. Seventeen have already fruited.

I have been unable to ascertain where and when the first budded avocado trees were produced in this state, but Dr. Franceschi probably deserves this credit.

The number of varieties of distinctively California origin which I have listed is 54; those of foreign origin number 86, a total of 140 named varieties.

California seedlings are fruiting and varieties are being obtained elsewhere in such numbers every season that the list is likely to be considerably lengthened. Many local seedlings are undoubtedly as good and some are much better than several of the varieties already named. It is unwise to give names to seedlings which appear here and there until they prove themselves superior to established varieties of the same type. This superiority may manifest itself in productiveness, hardiness or resistance of the tree to soil conditions or disease, or quality and flavor of the fruit.

While some may think it best to omit from the list and forget the names of certain varieties previously described, it is true that many trees under these names have been planted along the coast and throughout the interior valleys of the state where they may prove to have qualities which show them worthy of further propagation, especially as home fruits. It will at least be several years before they can be eliminated from the variety list in untested localities.

The names of varieties follow in alphabetical order, the abbreviations after each being: Guat. for Guatemalan type; Mex. for Mexican, and W. I. for West Indian:

Alto (Guat.).

Introduced as budwood in 1911 by the West India Gardens under No. 28 from Atlixco, Puebla, Mexico. Described by K. A. Ryerson in the Pomona College Journal of Economic Botany for February, 1913.

Ameca (Guat.).

Introduced as budwood in 1912 by the West India Gardens under the name Furnival No. 1, from Ameca Valley, Jalisco, Mexico. Described under the latter name by Ryerson in the Pomona Journal for February, 1913.

Atlixco (Guat.).

Introduced as budwood in 1911 by the West India Gardens under No. 29 from Atlixco, Puebla, Mexico. First described by K. A. Ryerson in the Pomona Journal of Economic Botany for February, 1913.

Azusa (Mex.).

Original tree at Azusa in the dooryard of Mrs. Henry Roberts. Budded trees bearing in 1916. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Baldwin (W. I.).

A Florida variety described by P. H. Rolfs in 1905 under S. P. I. No. 12933* and included in the descriptions by F. W. Popenoe in the Pomona Journal for February, 1911. Named for Mr. Baldwin of Miami, Florida, who owns the original tree.

Bartley (Guat.).

Original tree growing on place now owned by Bartley Bros., Santa Ana, R. D., the same place on which the original Northrop tree stands and adjoining the place on which the Sharpless and Monroe varieties originated. The tree was planted about 1907 by J. H. Northrop now of Indio, who formerly owned the place.

The tree bore 36 fruits in 1916 and specimens were exhibited at the Association meeting in Los Angeles in April. Since the description of the fruit has not appeared previously in these Proceedings, it is here given: fruit very large, 6 inches long, 4½ inches in diameter and 32 ounces in weight; color, deep green; surface, dull, rather rough; skin, thick, granular; flesh, creamy, thick, buttery, of excellent flavor and very slight fiber; seed, tight in cavity, roundish, tapering toward the apex, 2¼ inches each way, with two seed coats adhering to the seed. Season at Santa Ana, May 15th to July 1st.

Bartlett (W. I.).

A Cuban variety described under S. P. I. No. 40978.

Beauty (Guat.).

Original tree on place of C. P. Taft of Orange; seed planted by him in 1902; the latest of all Mr. Taft's varieties to mature, coming from June to October. First described by F. O. Popenoe in these Proceedings for October 23, 1915.

Blackman (W. I.).

A Florida variety described by P. J. Wester and included by F. W. Popenoe in the descriptions in the Pomona Journal for February, 1911.

Blake (Mex.).

Original tree growing at 389 S. Fairoaks avenue, Pasadena; planted about 1903; first described by F. W. Popenoe in Pomona Journal for February, 1911. Budded trees now bearing in many localities, some in the San Joaquin Valley; reported to have matured three distinct crops at Goleta in 1914–15. No longer being propagated in any quantity. Fruit very susceptible to decay organisms while still on tree.

Blakeman (Guat.).

Variety originated from the seeds of avocado brought by John Murrietta or received by him from his brother near Atlixco, Mexico. He gave some seeds to Mr. Habersham, then residing at the head of La Brea street in Hollywood, who planted them in 1904. The place is now owned by E. W. Dickey. In 1913 the production was a few fruits; in 1914, from 25 to 50 fruits; in 1915, about 250; and in 1916, good crop. The variety was first described by Ryerson in the Journal of Agriculture for November, 1913, under the name of Dickey No. 2. It has also been known as Habersham.

Brodia (Guat.).

Original tree on place of C. P. Taft of Orange; seed planted by him about 1902. When first tasted the flavor of the fruit had a fancied resemblance to that of an onion, hence the name Brodia, a native wild flower, sometimes but incorrectly known as wild onion. Tree severely frosted in 1912–13. Fruits produced at Orange in 1916 on a five-year-old bud in a three-year seedling. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

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*S. P. I. refers to the Seed and Plant Introduction, U. S. Department of Agriculture, Washington, D. C.

Buddington (Guat.).

Original tree on place of Mrs. Buddington, 776 New Depot street, Los Angeles. No description of fruit published.

Butler (W. I.).

A summer ripening variety, being extensively propagated by U. S. D. A. at Miami, Florida, under S. P. I. No. 26690. A tree is fruiting this season at Mr. Spink's place, Duarte, under this S. P. I. number.

Canto (Guat.).

Introduced as budwood in 1911 from Atlixco, Puebla, Mexico, by West India Gardens under No. 25. Described by Ryerson in the Pomona Journal for February, 1913.

Canyada.

Introduced as budwood in 1911 from Canyada, Queretaro, Mexico, under No. 9. First described by Ryerson in the Pomona Journal for February, 1913. One fruit set on a budded tree at Altadena in 1916.

Cardinal (W. I.).

A Florida variety described by P. J. Wester; foliage exceptionally handsome, being crimson when young, hence the variety name. Introduced into California and being tested out in some localities.

Carton (Mex.).

Original tree owned by P. F. Carton, San Fernando; seed planted in May, 1907, from an extra large, green fruit sent from Guadalajara, Mexico. The tree is said to have borne the third year from seed 67 fruits; fourth year, 780; fifth year, 227; sixth year, 460; and seventh year, 1,000 fruits or more. Several budded trees bearing at San Fernando, 1916. Variety first described by Ryerson in the Journal of Agriculture for November, 1913.

Challenge (Guat.).

Original tree owned by J. H. Walker, 1547 Las Palmas avenue, Hollywood; said to have been planted about 1897. Tree began bearing at seven or eight years of age and following crops averaged from 800 to 1,500 fruits. It failed almost completely one season several years before the freeze of 1912–13 and also the one immediately after. In 1914–15 there were approximately 2,500 fruits on the tree, but in 1916 only six fruits were produced, seeming to indicate the habit of bearing in alternate years, which is common with many other kinds of fruit trees, due no doubt to overproduction. Mr. Walker actually sold 1,540 fruits from the tree in 1915 for $756.36. There were also a good many fruits used in the family, of which no account was made, and 200 were picked to lighten the branches.

During the cold spell of January, 1913, the tree was subjected to two nights of frost, the first with a temperature of 24° and the second of 18°; the tips of the branches were frozen and in exposed places some of the older wood was killed, but the fruit escaped. The worst feature was the failure of the tree to set fruit that spring for the following season. The variety was first described by F. O. Popenoe in these Proceedings for October 23, 1915. Budded trees fruiting in 1916.

Champion (Guat.).

Original tree on place of C. P. Taft of Orange; seed planted by him in 1902. Budwood was sent to Florida in 1916 for trial. First described by F. O. Popenoe in these Proceedings for October 23, 1915.

Chappelow (Mex.).

Original tree owned by Wm. Chappelow, Monrovia. The seed from which the Chappelow avocado was grown was sent by the U. S. D. A. in the summer of 1893.

They had been received from Mr. F. Foex, then of Eddy, New Mexico, who had obtained them from fruits found on trees near Monterey, Mexico, where they had been subjected to a temperature of about 22° Farenheit during several consecutive nights when in blossom during the preceding winter.

The seedling was grown in a pot and not planted out until the following spring. The winter of that year (1894) was very cold and the small tree was frosted down to the ground and came up again the next spring. The tree began bearing the fourth and fifth years from planting and has been bearing every year since except the year of the heavy freeze of January, 1913. Buds of the tree were sent to Professor Rolfs of Miami, Florida, in 1902. He top-worked them onto seedlings and two years later obtained fruit. Professor Rolfs named the variety after Mr. Chappelow, by which name it has been known since. The tree is now 23 years old and is the largest in California; possibly in the United States. The tree itself has never been injured by frost since it was one year old, but several years the crop of fruit has been lessened by an extra cold snap in blooming time. The tree has always borne a crop with the exception of 1913, when the thermometer went down to 10° and all the fruit and bloom were killed. It bloomed again later on, but only a small number of fruits set. The record of the number of fruits since 1902 is as follows: 1902, 310; 1903, 380; 1904, 605; 1905, 575; 1906, 235; 1907, 465; 1908, 1,209; 1909, 260; 1910, 285; 1911, 1,025; 1912, 350; 1913, 20; 1914, 3,215; 1915, 1,723. Seedlings of the Chappelow have borne fruit remarkably like that of the parent tree, due either to its isolation which prevents cross-pollination with other varieties or to the pure strain of seed from which it came. Budded trees have been bearing for several years in various parts of southern California. Some trees are known to produce small, elongated, seedless fruits in addition to normal specimens.

The variety was named and described by P. H. Rolfs under S. P. I. No. 12934 in 1905. A description, history and colored reproduction of the fruit is given in the U. S. D. A. Yearbook for 1906, pp. 363, 364. An outline drawing was published in 1904 in Bulletin 61, Bureau of Plant Industry, by P. H. Rolfs.

Chili (Guat.).

Imported as budwood from an altitude of 6,000 feet in Chili in June, 1911, by D. E. Clower of Monrovia through Dr. W. E. Aughenbaugh. Described by K. A. Ryerson in the Pomona Journal of February, 1913.

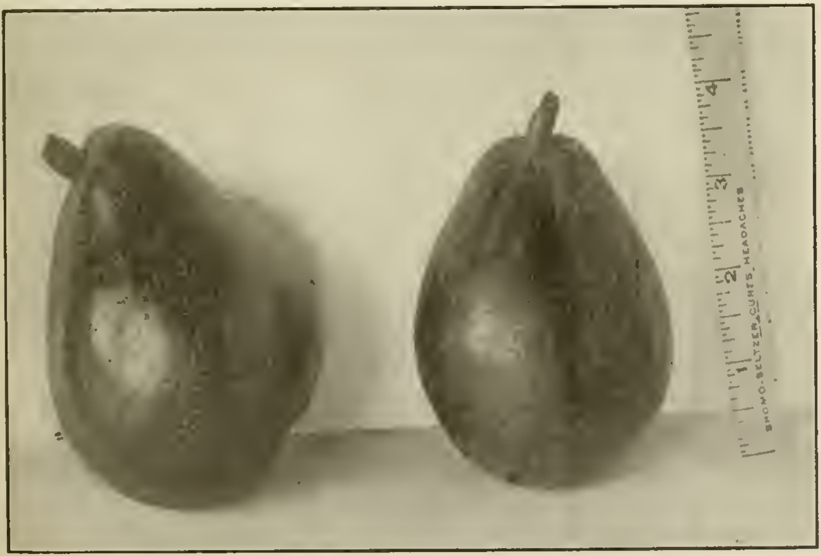

FIG. 2.—Fruits of the Harman avocado should be picked from the tree just before they begin to color so as to avoid the softening at the apex which injures the appearance and eating quality of the fruit. (Photo by the Division of Citriculture, University of California, Berkeley, Cal.)

Christmas Red (W. I.).

Described in John B. Beach's Florida Catalogue as a seedling from the Trapp which produces a fruit more oval in form than the parent and mahogany red.

Colima (Guat.).

Introduced as budwood in 1912 by the West India Gardens from near Colima, Mexico, as Johnston No. 5. Fruit not yet accurately described.

Colon (Guat.).

Introduced as budwood in 1911 by West India Gardens, from Atlixco, Mexico, under No. 24. First described by F. O. Popenoe in these Proceedings for October 23, 1915.

Colorado (Guat.).

Original tree planted on College street, Los Angeles, about 1901 by J. Murrieta, the seed coming from Atlixco, Mexico. In May, 1914, the tree was transplanted by E. L. Doheny to his home grounds, Beverly Hills, near Los Angeles, and is fruiting in 1916. Buds of the Colorado placed in large seedlings have produced fruit at Duarte. Variety first described by Ryerson in the Journal of Agriculture for November, 1913.

Cyrus.

A Florida variety described by P. J. Wester in 1910, probably under S. P. I. No. 26699.

Davis Nos. 4, 6, 7.

Analyses of these three varieties are given in the Hawaii Station Report for 1914, p. 66.

Dickey (Guat.).

Original tree on place of E. W. Dickey, head of La Brea avenue, Hollywood. Seed from Atlixco, Mexico, planted about 1904. First crop about 300 fruits. Budded trees very difficult to grow and very few are thriving; several fruiting, however, at Yorba Linda in 1916, also at San Fernando. Buds sent to Florida fruited during the winter of 1915–16. Variety described by Ryerson in Journal of Agriculture for November, 1913.

Dickey A.

Original tree on place of E. W. Dickey, Hollywood; planted about 1904. Budded tree bearing heavy crop at Nordhoff in 1916. Described by Ryerson in the Journal of Agriculture, November, 1913, under the provisional name of Dickey A.

Dickinson (Guat.).

Original tree growing at 679 W. Thirty-fifth street, Los Angeles. Mrs. M. J. Dickinson, 630 W. Thirty-fifth street, planted the seed and owned the tree up to 1912. According to Mrs. Dickinson, a grocer of the neighborhood went to Honduras and when he came back brought two avocado seeds with him. She planted these about 1899. One seedling was killed by the frost, while the other was planted near the house and grew thriftily, being more sheltered. It bore a few fruits in 1909, 1910 and 1911, 50 or so each year, while in 1912 the fruit on the tree sold for $150, at 25 cents each. In 1912–13 it was more or less frosted and did not bear much fruit until 1916, when 450 fruits matured. Another report says that the seed came from the city of Guatemala. The variety was first described by Ryerson in the Journal of Agriculture, November, 1913.

Don Carlos.

A Cuban variety described in 1916 under S. P. I. No. 40979.

Eskbank.

A Hawaiian variety especially recommended for planting in the islands.

Estelle (W. I.).

A Florida variety described in nursery catalogs.

Family (W. I.).

A Florida variety described and figured by a colored plate in the Yearbook for 1910, p. 431. First described in 1905 by P. H. Rolfs under S. P. I. No. 12935.

Farnsworth.

A Hawaiian variety especially recommended for planting in the islands.

Ferry (Guat.).

Original tree growing on place of Dr. F. C. Ferry, Hollywood boulevard, and Serrano avenue, Hollywood. Tree was planted in 1898 as a seedling from the Sturtevant nursery. The first fruits were produced about 1910; there were none on the tree in 1914, but in 1915 the tree bore 12 to 15 dozen and in 1916 a total of 23 dozen, which sold at $1.50 a dozen. No fruits have set in 1916. The tree was damaged by fire in 1907, one side of the trunk still showing the effects. Buds placed in a large seedling have produced fruit at Mr. Spink's place. Described by F. O. Popenoe in these Proceedings for October 23, 1916.

Fowler (Mex.).

Original tree growing on place of Mrs. E. M. Fowler, 363 Grove street, Pasadena. Seed was planted in 1902 and is said to have been obtained from the garden of Charles M. Cook of Honolulu. One account states that it is a seedling of the Blake. Budded trees fruiting in several localities this season, some in the San Joaquin Valley. The variety was described by F. W. Popenoe in the Pomona Journal for February, 1911. Nearly 1,000 fruits were produced on the original tree in 1915.

Fuerte (Guat.).

Introduced as budwood in 1911 from Atlixco, Puebla, Mexico, under No. 15. Budded trees are bearing this year for the first time at Yorba Linda and Altadena. Described by Ryerson in the Pomona Journal for February, 1913, as No. 15.

Fulford.

A Florida variety, budded trees of which are growing in the propagating house of Plant Introduction Gardens, Chico, under S. P. I. No. 36709.

Ganter (Mex.).

Original tree growing on the place of H. A. Woodworth, Rideout Heights, Whittier. The seedling tree was purchased with several other trees from a nurseryman of Whittier, I. H. Cammack, by A. R. Rideout, who planted it in the spring or summer of 1905. The seedling was about three feet in height and at least one-half of the bark sun-burned so that it took a long time for this to heal over. At the same time about a dozen other trees were planted but the Ganter proved to be the only one worthy of mention. Just as the tree came into bearing the place was sold to A. M. Ganter, after whom the variety was named. A little later Mr. Woodworth bought the property and some trees have been disseminated under the name

Woodworth. Budded trees are bearing in many localities. Small seedless fruits are sometimes produced in addition to normal specimens. Described by F. W. Popenoe in the Pomona Journal for February, 1911.

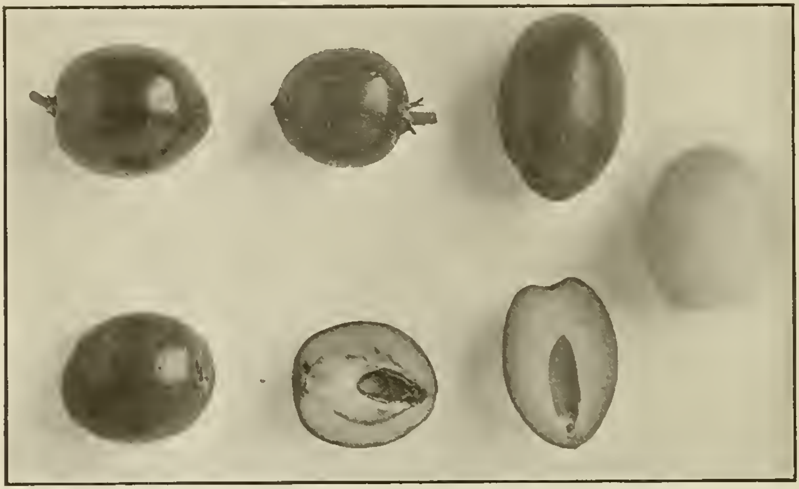

FIG. 3.—Seedless avocados have appeared in several places in southern California. These fruits are purplish black and resemble plums. They may be eaten skin and all. (Photo by Division of Citriculture, U. of C., Berkeley.)

Gordo (Guat.).

Imported as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 14. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Gottfried.

A Florida variety described in 1906 under S. P. I. No. 19094.

Grande (Guat.).

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 39. Described by Ryerson as No. 39 in the Pomona Journal for February, 1913. Fruiting at Upland and Riverside in 1916.

Grant (W. I.).

A variety collected from Bahama Islands, British West Indies, by P. J. Wester in 1906 and described under S. P. I. No. 18731.

Guadalupe (W. I.).

A Cuban variety described in 1916 under S. P. I. No. 40980.

Guatemala.

A variety introduced by U. S. D. A. and which fruited in Florida for the first time in April, 1914.

Harman (Mex.).

Original tree on place of E. N. Harman, Sherman, Foothill boulevard. It is said to be one of six trees brought to California from South America and planted by Mrs. Charles Horn on her ranch at Sherman in 1899. Mr. Harman acquired the place in 1905 just as the tree was beginning to bear. Since that time the crop has averaged about 1500 fruits. Budded trees are bearing in many localities and trees have been widely disseminated in California. First described by F. W. Popenoe in the Pomona Journal for February, 1911.

Hathaway (Mex.).

Original tree on place of B. Hathaway, 1659 Miller avenue, Hollywood. The tree was grown from a seedling obtained from Mrs. Miller in 1904. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Hollenbeck (Mex.).

Original tree growing at the Hollenbeck home in Los Angeles. Budded trees listed in nursery catalogs in 1915. Described in these Proceedings for October 23, 1915.

Horn (Mex.).

Original tree growing on place of Ed Harman at Sherman until about two years ago, when it was removed. Budded trees advertised in nursery catalogs in 1914; propagated in small way only.

Hulumanu.

Recommended for planting in Hawaii in 1915.

Ideal (Guat.).

Imported as budwood from Mexico by D. E. Clower of Monrovia. Described by Ryerson in the Pomona Journal for February, 1913.

Ingersol (Mex.).

Described in the California Cultivator for October 28, 1916, as follows: the tree stands eight feet high and has a spread of about 12 feet. "It bore this year 180 fruits of an average size of 3½ inches long and 2¼ inches in diameter and an average weight of 5½ ounces. It is a thin-skinned variety of deep purple color. The flesh is of excellent quality. The tree blooms in March and the fruit ripens in August, September and October."

Inezholt.

A Hawaiian variety imported in the spring of 1914 by Joseph Sexton of Goleta, under No. 1907, or Holt's No. 1. Especially recommended in 1915 for planting in the islands.

Jersey Cream.

A Hawaiian variety imported in 1914 by Mr. Sexton of Goleta as No. 1911.

Johnston (Guat.).

Introduced as budwood in 1912 by the West India Gardens from near Colima, Mexico, under Johnston No. 6. Fruit not yet described.

Johnstone (W. I.).

A variety described by P. J. Wester in 1906 under S. P. I. No. 18729. Budwood originally from Bahamas.

Kailua.

Recommended in 1915 for planting in Hawaii.

Knight (Guat.).

Introduced under No. 27 as budwood in 1914 by E. E. Knight, Yorba Linda, from Antigua, Guatemala. Fruit round, 4 inches diameter, 1½ pounds weight; surface, slightly rough; skin, a hard shell, woody, green in color; flesh, firm, yellow, free from fiber, rich nutty flavor; seed, medium size, tight in cavity. Bloom first of June; season following November until last of March in Guatemala. Description by Mr. Knight.

Knowles (Mex.).

Original tree on place of W. A. Knowles, Santa Barbara; planted in 1898 and at eight years of age produced about 1,000 fruits. Annual crop from 150 to 1,200 fruits. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Lambert (Guat.).

Original tree on place of C. F. Wagner, corner Fairfax and Fountain streets, Hollywood. The seed was obtained from a fruit on the Los Angeles market and planted in 1907. In 1915 it bore three fruits and in 1916 four fruits. The variety was given Mrs. Wagner's maiden name. Described by F. O. Popenoe in these Proceedings for October 23, 1916.

Landon.

A Florida variety included in descriptions made by F. W. Popenoe in the Pomona Journal for February, 1911.

Largo.

A variety described in 1906 by P. J. Wester under S. P. I. No. 18730; originally from Bahama Islands.

Linda (Guat.).

Introduced as budwood from Guatemala in 1914 by E. E. Knight of Yorba Linda as Knight's No. 39. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Luisa.

A Cuban variety described in 1916 under S. P. I. No. 40912 and being tested out in Florida.

Lycett.

Especially recommended in 1915 for planting in Hawaii.

Lyman.

Recommended in 1915 for planting in Hawaii.

Lyon (Guat.).

Original tree on place of Miss A. M. Lyon, 7276 Sunset boulevard, Hollywood. The seed was from a fruit purchased on the Los Angeles market and planted in 1908. The original tree is not very large, having been cut heavily for budwood and also somewhat injured by the freeze of 1912–13. Budded trees have proved to be very precocious, literally blossoming and bearing themselves almost to death unless prevented by thinning the fruit.

Lyon (Guat.).

Two varieties have been described under the name of Lyon. This one was described by P. J. Wester in the Philippine Agricultural Review for February, 1914. The original tree grew from seed imported in 1903 by L. Lyon, the horticulturist at that time.

Macdonald.

Especially recommended in 1915 for planting in Hawaii.

Magoon.

Introduced as budwood in 1914 from Hawaii by Joseph Sexton of Goleta under No. 3203. Especially recommended in 1915 for planting in Hawaii.

Makaha I and II.

Analyses of these two varieties are given in the Hawaiian Station Report for 1914, p. 66.

Matamoras.

A hardy variety secured from across the river in Mexico, near Brownsville, Texas. A budded tree is growing in the propagating house of the Plant Introduction Gardens, Chico.

Mattern (Mex.).

Original tree growing in Los Angeles, fruiting in 1912. Short description by F. O. Popenoe in these proceedings for October 23, 1915.

Merced.

A Cuban variety described in 1916 under S. P. I. No. 40981 and introduced into Florida for trial.

Merito (Guat.).

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 18. Budded trees set fruit in Altadena in 1916. Described by K. A. Ryerson in Pomona Journal for February, 1913.

Meserve (Guat.).

Original tree growing on place of Ralf Goddard, corner Cherry and Hill streets, Signal Hill, Long Beach. Said to have been grown from a seed obtained from Honolulu about 1901 by Mrs. Meserve who formerly owned the place. Described by Ryerson in the Journal of Agriculture for November, 1913.

Miles (Guat.).

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 35. Briefly described by F. O. Popenoe in these Proceedings for October 23, 1915.

Miller (Guat.)

Original tree on place of Jacob Miller, head of Miller avenue, Hollywood. Seedling tree said to have been brought from Guatemala by John Grelck, an uncle of Mrs. Miller, and planted in 1886 on a neighboring place, from which it was transplanted about 1910. The tree blooms profusely and sets an immense crop of fruits which, however, keep dropping until very few mature. Described by F. W. Popenoe in the Pomona Journal for February, 1911.

Mitchell.

Originated in Porto Rico and introduced into Florida in 1906 for trial. Described under S. P. I. No. 18120.

Moanalua.

A chance seedling about 25 years of age growing on the estate of S. M. Damon Moanalua, Hawaii. A bud on Mr. Spinks' place at Duarte has developed into a tree but has proved very tender, the young foliage and twigs being spotted and blackened by cool nights; some fruit is maturing this season. Described by J. E. Higgins in the Hawaii Station Report for 1910.

Modesto (Guat.).

Introduced as budwood in 1912 from Altlixco, Puebla, Mexico, by the West India Gardens. Briefly described in these Proceedings for October 23, 1915.

Monrovia (Mex.).

Original tree on part of the Bradbury Estate, Duarte, formerly called the Winston ranch, but now owned by Miss Louisa Bradbury who has named it the "Valadenia." Parent tree quite large, from 20 to 25 years old, bearing a very large oval leaf; very few propagated. Budded tree fruiting at Thos. H. Shedden's place, Monrovia, 1916. Described by F. W. Popenoe in these Proceedings for October 23, 1915.

Monroe (Guat.).

Original tree on place of B. H. Sharpless, Santa Ana, R. D. Tree was planted in 1905 and bore 2 fruits in 1914, 5 in 1915, and 60 in 1916. It was named for Mrs. Sharpless, whose maiden name was Monroe. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Montezuma (Guat.).

Introduced as budwood in 1911 by the West India Gardens from Atlixco, Puebla, Mexico, under No. 33. Described and figured by Ryerson in the Pomona Journal for February, 1913.

Murrietta (Guat.).

Original tree growing at 765 College street, Los Angeles. Planted about 1910 by John Murrietta; seed secured from Atlixco, Mexico. Buds placed in large seedling trees have fruited at Mr. Spinks' place near Duarte. Budded trees fruiting at Mr. Shedden's place, Monrovia, 1916. Very few trees have been grown on account of difficulty of propagation. Sometimes known as Murrietta Green. Original tree said to have died recently. Described by Ryerson in Journal of Agriculture, for November, 1913.

Murrietta Two Pound or Two Pound Murrietta (Guat.).

Original tree said to be on the old Murrietta place, 765 College street, Los Angeles. Propagated and distributed by the Pioneer Nursery in 1915 and 1916. Fruit not yet described.

Northrop (Mex.).

Original tree on place of W. R. Bartley, Santa Ana, R. D. It was planted by J. H. Northrop, now of Indio, the seedling having been secured from C. P. Taft about 1900. The place was owned for many years by Mr. Eells and some budded trees have been disseminated under the name "Eells." In 1914 the tree produced 1800 fruits, and in 1915 about 1,000 fruits, bringing $2.50 a dozen on the Los Angeles and San Francisco markets. The tree produces a heavy crop in the fall and lighter crop in the spring. Described by Ryerson in the Journal of Agriculture for November, 1913.

Nutmeg (Guat.).

Original tree in orchard at Hawaii Experiment Station, Honolulu; seedling planted in March, 1908, and tree came into bearing in December, 1911. Described by C. J. Hunn in Hawaii Station Report for 1912, p. 38. Budded trees are growing in California at Goleta and Pasadena.

Obispo (Guat.).

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 41. Described by Ryerson as No. 41 in the Pomona Journal for February, 1913.

Oro (Guat.).

Introduced as budwood in 1911 by West Indin Gardens from Atlixco, Puebla, Mexico, under No. 32. Described as No. 32, by Ryerson in the Pomona Journal for February, 1913.

Pico (Mex.).

Original tree on place of Jacob Miller, Hollywood; moved recently to Doheny place. Very few trees propagated. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Perfecto (Guat.).

Introduced as budwood in 1911 from Atlixco by the West India Gardeus under Nos. 19 and 22. One fruit matured on a three-year-old bud at Altadena in 1916. Described and figured by Ryerson as No. 19 in the Pomona Journal for February, 1913.

Plata (Mex.).

Introduced as budwood in 1911 by the West India Gardens from Santa Maria del Rio, San Luis Potosi, Mexico, under No. 2. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Pollock (W. I.).

Original tree on grounds of S. H. Pollock, Miami, Florida, and planted about 1896 or 1897. Budded trees were disseminated under the variety name as early as 1901 by a Florida nursery; described in 1905 under S. P. I. No. 12936. It is fully described and a colored plate of the fruit given in the Yearbook for 1912, p. 272. Budded trees fruiting at W. A. Spinks' place, 1916.

Pomona (Mex.).

Original tree on grounds of Mrs. Anna Skinner, 533 West Ninth street, Pomona. A hardy variety distributed a few years ago but no longer being propagated. Fruit small, purplish-black. A three year old budded tree is thriving near Sacramento and this year produced twelve fruits.

Popocatepetl (Guat.).

Introduced as budwood in 1912 by West India Gardens from Atlixco, Mexico. Described by Ryerson in the Pomona Journal for February, 1913.

Presidente (Guat.).

Original tree growing at 765 College street, Los Angeles. Seed planted by John Murrietta about 1901. Described by Ryerson as El Presidente in the Journal of Agriculture for November, 1913.

Preston.

A variety described in Hawaii Bulletin No. 25 a No. 157 and which G. P. Wilder calls Preston.

Puebla (Guat.).

Introduced as budwood in 1911 by West India Gardens from Atlixco, Puebla, Mexico, under No. 13. Budded trees are maturing fruit at several localities this season. Described by Ryerson in the Pomona Journal for February, 1913.

Quality.

A Florida variety described by P. J. Wester and included in the descriptions given by F. W. Popenoe in the Pomona Journal for February, 1911. Several budded trees growing in California.

Queen (Guat.).

Introduced as budwood in 1914 by E. E. Knight of Yorba Linda from an elevation of 5,200 feet in Guatemala under Knight's No. 28. Described by F. W. Popenoe in these Proceedings for October 23, 1915.

Queretaro (Mex.).

Introduced as budwood in 1911 by the West India Gardens from Canyada, Queretaro, Mexico, under No. 11. Described by Ryerson in Pomona Journal for February, 1913. Budded trees fruiting this season at Yorba Linda, Monrovia, Nordhoff, Tustin.

Rader.

Listed in the 1915 catalog of Griffing Bros., Jacksonville, Florida.

Rainey (Mex.).

Original tree on place of Mr. Rainey, Santa Barbara street, Santa Barbara; said to be a seedling of the White. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Redondo (Guat.).

Introduced as budwood in 1911 from Atlixco by the West India Gardens under No. 16. Budded trees fruiting at Yorba Linda this season. Described and figured by Ryerson in the Pomona Journal for February, 1913.

Rey (Guat.).

Introduced as budwood in 1914 by E. E. Knight of Yorba Linda from an elevation of 5,200 feet in Guatemala. Original tree low and round in outline; 25 feet high with a trunk about 14 inches diameter; yield in Guatemala 500 fruits; season October to April; probable age of tree, 20 years. Fruit, average weight one pound; color green; surface rough; rind thick; fiber none; quality very nutty; size of seed medium; tight in the cavity. Description furnished by Mr. Knight. The name Rey was suggested by the owner of the original tree, who said it was king of all varieties he knew.

Rhoad (Guat.).

Original tree on place of C. P. Taft, Orange. Seed planted in 1902; tree bearing its first fruit at five years of age and it is said to have brought in more actual money returns than the original Taft tree. In 1915 it produced 500 fruits, and in 1916 1,200 fruits. Budded trees fruiting at Orange and Goleta, 1916. First described by Ryerson in the Journal of Agriculture, November, 1913.

Rico.

A Florida variety. Described in 1905 under S. P. I. No. 13,731.

Rita (Guat.).

Original tree on place of C. P. Taft, Orange. Seed planted in 1902; described by Ryerson in the Journal of Agriculture for November, 1913.

Rodolph (Mex.).

Original tree on place of Mr. R. D. Fish, 231 Jasmine avenue, Monrovia. Said to be a seedling of the Chappelow; planted about 1906 or 1907. It began to fruit when only four or five years old, bearing a large crop for such a small tree. In recent years it has been an irregular bearer. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Royal (Guat.).

Original tree on place of J. H. Walker, 1547 Las Palmas avenue, Hollywood. Tree planted about 1897 and began bearing in the seventh or eighth year. It had in round numbers 300, 400 and 500 fruits in 1910, 1911 and 1912, respectively.

In 1914 the tree produced nearly 1,000 fruits. Described by Ryerson in the Journal of Agriculture, November, 1913.

San Sebastian (Mex.).

Introduced as budwood in 1911 from San Sebastian, Queretaro, Mexico, by the West India Gardens under No. 7. Proved to be hardy in 1912 and 1913, being untouched in exposed position by temperature of 16 degrees. Described by Ryerson in the Pomona Journal for February, 1913.

Senor (Guat.).

Original tree on place of C. P. Taft, Orange. Seed planted in 1901. Described by Ryerson in Journal of Agriculture for November, 1913.

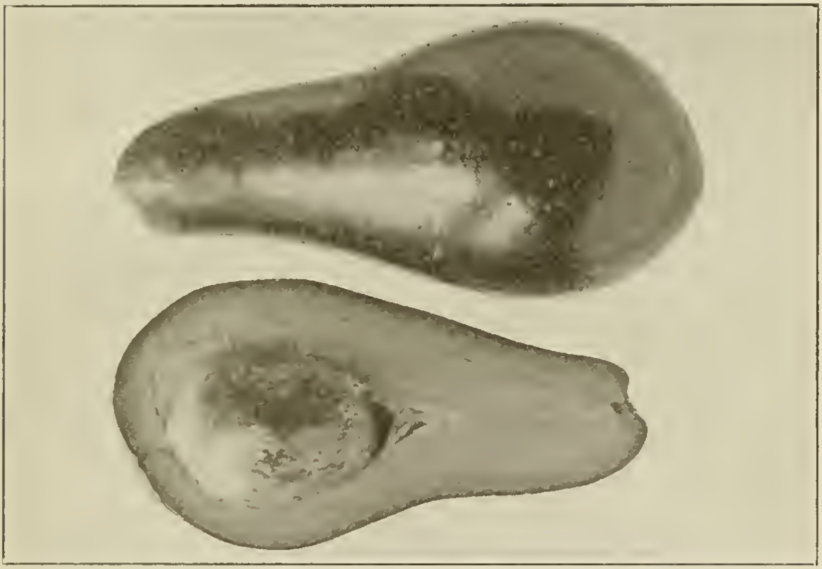

FIG. 4.—The largest avocado tree in California is that of the Chappelow. The fruit is a good example of the thin-skinned Mexican type, having a distinct neck, purplish black color and glossy surface. (Photo by the Division of Citriculture, U. of C., Berkeley.)

Schmidt (Guat.).

Introduced as budwood in 1911 by West India Gardens from Atlixco, Mexico, under No. 40. The Schmidt ripened fruit in Florida during the winter of 1915 and 1916. Described by Ryerson as No. 40 in the Pomona Journal for February, 1913.

Sharpless (Guat.).

Original tree on place of B. H. Sharpless, Santa Ana, R. D. No. 1, adjoining the place on which the Northrop tree is growing. Mr. T. Gackley is said to have bought the tree as a seedling in 1901 from C. P. Taft. It fruited first at nine years of age. In 1912 the crop was two fruits; in 1913, 20; in 1914, 75; in 1915, 250; in 1916, several hundred. Two-year-old buds in large seedling trees are setting heavily this season. Described by Ryerson in the Journal of Agriculture, November, 1913.

Sinaloa (Guat.).

Introduced as budwood in 1911 by the West India Gardens from Atlixco, Mexico. The Sinaloa ripened fruit in Florida during the winter of 1915–16. Budded trees at Yuba City, California, have proved hardy. Fruiting on three-year buds on old seedling at E. W. Dickey's place, Hollywood. The variety described by F. W. Popenoe in the Pomona Journal for February, 1911, is no longer in existence, the name being transferred to this variety. Described by Ryerson in the Pomona Journal for February, 1913.

Skinner (Mex.).

Advertised in nursery catalogs of 1914. Listed but not described in these Proceedings for October 23, 1915. Very few trees propagated.

Smith (Mex.).

Original tree on the place of C. R. Smith, 1308 N. Main street, Santa Ana. Said to be a budded tree of a Mexican seedling, planted in 1906. It bore its first crop at seven years of age, producing 783 fruits at that time. The fruit is small, weighing from three to five ounces, but very rich in flavor and practically free from fiber. During 1914 it produced over 1,000 fruits.

Solano (Guat.).

Original tree on the Solano Estate, Hollywood. The origin of the seed not definitely known but said to have been planted by Mr. Murrietta. According to J. E. Higgins the Solano is a Hawaiian seedling. First crop produced in 1912. In 1913 about 150 fruits and in 1915 about 325 fruits were produced, while in 1916 only two matured. The Solano ripened fruit in Florida during the winter of 1915–16. Buds of the Solano on large seedling trees matured fruit in 1916 on Mr. Spinks' place at Duarte; fruit also maturing elsewhere for 1917. Described by Ryerson in the Journal of Agriculture for November, 1913.

Spinks (Guat.).

This variety originated as a promising seedling in a nursery row on W. A. Spinks' place at Duarte. A bud was taken from the seedling, placed in an older tree and produced 19 fruits in 1915. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Sterling.

A Florida variety described by Wester under one of the S. P. I. numbers 26,689 to 26,730. Descriptions included in those given by F. W. Popenoe in the Pomona Journal for February, 1911.

St. Petersburg.

A Florida variety described in 1907 under S. P. I. No. 26,699. A budded tree is growing in the propagation house of the Plant Introduction Gardens at Chico.

Surprise (Guat.).

Original tree on place of C. F. Wagner, Hollywood, California. Seed planted from a fruit shipped from Mexico in the fall of 1908. The tree produced one fruit in 1915 and in 1916, 81 fruits were gathered. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Taft (Guat.).

Original tree on place of C. P. Taft, Orange. Seed planted in 1900. The tree bore six fruits at nine years of age. It then skipped a year and produced a good crop during the next three years. In 1912 it produced 120 fruits; in 1913, 120; in 1914, 120; in 1915, 300; in 1916, 700. Budded trees are bearing this season in different places in southern California as well as in the San Joaquin Valley, although buds placed in large seedlings have borne fruit at Mr. Taft's place the last two years. Described by Ryerson in the Journal of Agriculture for November, 1913.

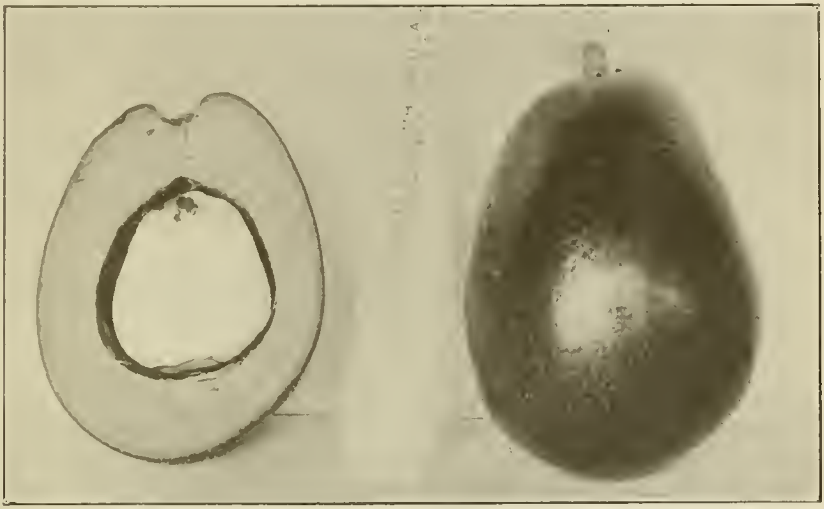

FIG. 5.—Budded trees of the Ganter have been fruiting for many years in this state. The loose seed is found in the fruit of many varieties, especially of the Mexican type, and is more or less of a defect. (Photo by the Division of Citriculture, U. of C., Berkeley.)

Taft Hardy (Mex.).

A variety propagated by some nurseryman and quite widely distributed a few years ago, but is no longer being propagated. Budded trees are bearing in different localities.

Taylor (Guat.)

A Florida variety described in 1916 under S. P. I. No. 26,710. The original tree is a seedling either of the Challenge or Royal, seeds of which were sent to Washington and planted at Miami in 1908.

Topa Topa (Mex.).

Original tree on place of E. S. Thacher, Nordhoff. The tree is one of 122 seedlings which were planted in orchard form in March, 1909, the seed having probably been planted in 1907. In 1911 the tree bore several fruits and has produced crops every year since. In January, 1913, the tree stood a temperature of about 20 degrees, carrying all its leaves uninjured and part of its bloom, maturing some fruit the following season. In 1914 the tree had about 200 fruits, but on account of the greater number they averaged considerably smaller in size. In 1916 the tree set an excessive crop; many dropped when smaller than eggs and of the rest a considerable share ripened at the stem end first, many dropping off. Several hundred marketable fruits, however, matured. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Trapp (W. I.).

Originated as one of a lot of seedlings planted about 1894 by S. C. Trapp in his garden at Cocoanut Grove, Florida. Described in 1905 under S. P. I. No. 12,937 and in the same year more fully described and figured in colored plate in the Yearbook. Considered by Florida growers and shippers to be the best variety for commercial planting in that state. Budded trees have been growing in California for several years but have made poor growth. A tree at Mr. Spinks' place, Duarte, is carrying fruit in 1916.

Two Pound Green (Guat.).

Introduced as budwood from an elevation of 6,000 feet in Atlixco, Mexico, by D. E. Clower of Monrovia through G. Fuentes. Described by Ryerson in the Pomona Journal for February, 1913.

Ultimate (Guat.).

Original tree on place of C. P. Taft, Orange. Seed planted in 1902 and, according to Mr. Taft, dropped its fruit badly during the early years of fruiting. Placed by Mr. Taft next to the Taft variety both in quality and hardiness. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Val de Flor (Mex.).

Introduced as budwood in 1912 by E. G. Hart of Los Angeles from the state of Oaxaca, Mexico. Budded trees fruiting this season show two types of fruit, one oblong and one bottle-necked. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Veranero.

A variety obtained by United States Department of Agriculture from Caracas, Venezuela, under S. P. I. No. 35,121, March, 1913. It is called Veranero on account of the crop coming at the end of the dry season, while the high time for the other varieties growing about Caracas is August. Said by Pittier to grow at some elevation and should do well in southern California, where the rain is somewhat scarce.

Verde (Guat.).

Introduced as budwood in 1911 by the West India Gardens from Atlixco, Mexico, under No. 17. Described by Ryerson in the Pomona Journal for February, 1913, as the California Trapp.

Volcan (Guat.)

Introduced as budwood in 1912 by the West India Gardens from Atlixco, Mexico. Described by Ryerson in the Pomona Journal for February, 1913, under the name "Itzia."

Wagner (Guat.).

Original tree on place of C. F. Wagner, Fairfax and Fountain avenues, Hollywood. The Wagner is said to be a seedling from the Royal and was planted in the spring of 1907, bearing its first fruit the fifth year, all dropping but three. The crop in 1914 was 36 fruits; in 1915, 442, and in 1916, 186 fruits. Budded trees have been bearing during the last two years; some four-year-old trees are carrying fruit in the San Joaquin Valley in 1916. Described by F. O. Popenoe in these Proceedings for October 23, 1915.

Walker (Guat.).

Original tree on place of J. H. Walker, 1547 Las Palmas avenue, Hollywood. It was planted in 1897 or 1898 and began bearing at six years of age, since which time it has produced every year except in 1914. The crop for the past few years has been from 1,800 to 3,000 fruits. In 1915 it produced about 3,500 fruits but fewer than that in 1916; has probably brought in more actual cash to the owner than any other fruit tree in California. Budded trees have been bearing for several years in various parts of southern California. Described by F. W. Popenoe in the Pomona Journal for February, 1911. Sometimes known as "Walker Prolific."

Wester (W. I.).

A Florida variety described under S. P. I. No. 19,297.

White (Mex.).

Original tree on the place of Mrs. G. A. White, 24 W. Arrellaga street, Santa Barbara. The tree was a seedling purchased from Dr. Franceschi in the fall of 1897, although Dr. Franceschi himself said that he raised the tree from a Mexican seed in 1895. The tree matured several fruits at three years of age and has borne every year since. During the last few years the approximate number of fruits would be around 400. Budded trees have been bearing for several years and in some cases have matured three and even four crops in one season. Described by F. W. Popenoe in the Pomona Journal for February, 1911.

Wilson (W. I.).

A Cuban variety introduced for trial in southern Florida and described in 1916 under S. P. I. No. 40,982.

THE PRESENT OUTLOOK FOR THE POMELO IN CALIFORNIA.

By R. S. Vaile, *Citrus Experiment Station, Riverside, Cal.*

Something over a year ago I presented in The Monthly Bulletin certain figures regarding the pomelo situation in the United States, and now by request, I am attempting to bring up to date some of the material presented. The only excuse for attempting to make further comment on this subject is that one or two rather interesting developments have taken place during the past 18 months which may in a slight degree affect the industry in California. The plantings in California have continued, but only in moderation, apparently. The plantings in Florida have been largely curtailed because of the citrus canker outbreak in that state, and in fact, the acreage reported as planted a year and one-half ago has probably been slightly reduced. At that time there were some 16,000 acres of bearing grapefruit and some 45,000 acres five years old and younger. It is probable, from such figures as we are able to get, that there are now somewhat over 20,000 acres in bearing in Florida and about 900 acres in California.

One of the very encouraging things for the industry in California is the fact that Mr. Shamel of the United States Department of Agriculture has discovered in his investigations of grapefruit varieties, a strain of Marsh Seedless grapefruit which appears to be admirably adapted to California conditions and which is apparently considerably better in quality than the average grapefruit produced in California in the past. The Grapefruit Club of California has considered the question of varieties and types at considerable length and they have agreed that this standard type of Marsh Seedless is the grapefruit of the future for California. They have gone so far as to advocate that no other type be planted in the future in California. This action should have a very healthful effect on the industry, as the tendency will be to gradually build up a standard product upon which the consuming public may absolutely rely. The Grapefruit Club's action carries with it the suggestion that all other types be rebudded to standard type just as rapidly as conditions justify, and many have already rebudded their entire orchards.

Mr. Shamel, in discussing the grapefruit situation before the Fruit Growers convention at San Bernardino in February, 1916, called particular attention to the desirability of holding California grapefruit later in the season than is commonly the practice, so that it might reach its full maturity. Experiments have been conducted by some of the California shippers which indicate that a large percentage of the crop, at least in southern California, might easily be held until after the first of July and a portion of the crop can be held either on the trees or in storage for shipment as late as the middle of September. It is probably even possible to hold a limited quantity of the fruit for the Thanksgiving market. This practice of late shipment would place grapefruit on the eastern market at the time when the Florida fruit is entirely off the market, and at a time also when other fruits are comparatively rare. Readers, generally, will be familiar with the really exceptional success which has accompanied the marketing of Valencia oranges during the past several seasons. Grapefruit held in the way suggested would come on the market at the same time of year that the Valencia crop does and should share in the high desire for fruit of similar character. Although certain California localities are claiming great things for their early grapefruit, I must say that my personal taste strongly prefers the more mature product.

Florida growers are feeling that the solution of their marketing problem when the large nonbearing acreage comes into full production will lie in considerable measure in the manufacture of grapefruit juice. It seems from tests that have been made by government investigators and others, that it is a comparatively simple thing to make a natural flavored grapefruit juice which will keep indefinitely when bottled. Up to the present time it has not seemed possible to do this with either lemons or oranges. Thus grapefruit seems to have an open field among the citrus fruits. With the increase of the prohibition territory in the United States, the demand for soft drinks should logically become greater and therefore an appetizing and healthful beverage such as grapefruit juice should find a large market. Already, several companies have been formed in Florida for the purpose of putting out this juice, and sales seem to have been fairly satisfactory during the past season. If a real trade can be worked up for such a product, there would seem to be a possibility of the distribution of a reasonable amount of it. Then if California fruit can be held until the time of year when the field developed by Florida advertising is left without other grapefruit, good prices might be expected for a reasonable amount.

It must be borne in mind, however, that grapefruit belongs to the citrus fruit family and that the limitations of planting are the same as those which affect other citrus fruits. The months which have just passed have illustrated again certain of the natural forces which tend to limit citrus districts. The combination of severe fall winds and temperatures below the freezing point have injured and almost ruined certain of the plantings in the newer citrus sections. In fact, some of the old sections have by no means entirely escaped. It is extremely doubtful whether sections which are accustomed to receiving, every second or third year, severe wind storms and damaging frosts, should ever be planted to citrus fruit of any sort. The expense of developing a citrus orchard is very heavy. The retarding effect of such winds as have visited certain of our sections this year, can hardly be estimated. In the final adjustment of orchard economics in California, only those districts which are particularly favored with mild climatic conditions can expect to successfully compete in the citrus industry.

ANALYSES OF SOME MORE RECENT AND OLDER PEST REMEDIES.

By M. R. MILLER, Insecticide Laboratory, University of California, Berkeley.

The inquiries received at the insecticide and fungicide laboratory in regard to the composition of the newer insecticides and fungicides, and the samples of these materials received there, indicate the interest taken in them by the agricultural public. Whenever a new remedy is offered for sale it is but a short time before general interest is aroused, and information is sought as to its composition and whether or not it is efficient for the purpose for which it was designed.

The efficiency of an insecticide or fungicide depends not only upon its action on the insects or fungi for which it is used, but almost equally upon the action it will have upon the host. Consequently the importance of knowing the presence of harmful ingredients is directly equal to that of knowing the presence and amounts of helpful constituents.

Taken altogether, the new materials examined in the laboratory during the past year have been found in most cases to be more efficient than inefficient remedies. Although there have been no radical discoveries made by manufacturers in the way of new materials, some new combinations of old and proven remedies are being offered. These mixtures, in some cases, are of especial value to the smaller consumer as the purchase and mixing of small quantities is obviated. In all cases, however, he should know the composition of the material he is using.

In the tabulations given of analyses, effort has been made to eliminate as many of the common materials as possible which have already been analyzed, and to present only the newer remedies and those concerning which there seems to be considerable doubt as to their constitution.

BORDEAUX PASTE.

Moisture	60.42%
Copper (metallic)	10.72%
Or, as copper oxid (CuO)	13.40%

For a fall spray it is to be used at the rate of from 8 to 10 pounds to 50 gallons of water. Used at this rate the spray will contain from 1.07 to 1.34 pounds of copper oxid (CuO) per 50 gallons of spray compared with the 1.21 pounds copper oxid contained in a homemade Bordeaux mixture spray, 4-4-50 formula using bluestone which is 95 per cent pure.

BORDEAUX MIXTURE, DRY POWDERED.

Moisture	1.73%
Copper (metallic)	11.52%
Or, as copper oxid (CuO)	14.40%

In order to obtain the same amount of copper oxide in a spray made from this material (1.21 pounds) as there is in 50 gallons of homemade spray, it will be necessary to use this dry powder at the rate of 8.34 pounds to 50 gallons of water.

COOPER'S FUNGICIDE.

Moisture	15.27%
Copper (metallic)	9.85%
Or, as copper oxid (CuO)	12.31%

To obtain 1.21 pounds of copper oxid in 50 gallons of spray it would be necessary to use this at the rate of 9.80 pounds to every 50 gallons of water.

CRUDE CARBOLIC ACID.

Sample	Total Phenols.
A	6.51%
B	1.73%
C	16.96%
D	17.45%

These results show well the variation in the crude carbolic acids found on the market at the present time. The only way in which a user can determine the quality of this class of materials is by having a chemical analysis made.

CHLORIDE OF LIME.

Sample	Available chlorine
A	21.54%
B	20.70%
C	33.79%

Samples A and B were commercial brands. Sample A was taken from a new can and B taken from a can from which a portion had been removed a year previous, the can having been tightly closed while not in use. Sample C is "chemically pure" material for laboratory purposes and the available chlorine was determined in it for comparative purposes.

FORMALDEHYDE FUMIGATOR.

Weight of product contained (paraform)	42.3 grams
The product contained formaldehyde	72.67%

GUM CINCH.

This material is a black viscous liquid having an empyreumatic odor. It was determined to be essentially pine tar, or pix liquida of the U. S. Pharmacopœia.

INSECT EXTERMINATOR.

Specific gravity	0.8447
Nitrobenzol	12.87%

A solution of nitrobenzol in kerosene.

LEAD ARSENATE, DRY POWDERED.

Moisture	0.57%
Total arsenic (As_2O_5)	32.45%
Water soluble arsenic (As_2O_5)	0.35%

Calculating from the moisture content it is necessary to use only one-half the amount of this dry powder as of lead arsenate paste containing 50 per cent of water to obtain sprays of the same strength.

LIME-SULFUR SOLUTIONS.

Sample	Specific gravity	°Baume	Thiosulfate sulfur, per cent	Sulfid sulfur, per cent	Total sulfur, per cent
Homemade A	1.241	28.0	3.56	11.80	18.60
Homemade B	1.273	30.9	4.78	12.43	20.55
Homemade C	1.242	28.1	3.96	8.91	18.97
Homemade D	1.226	26.6	3.72	10.93	17.56
Homemade E	1.261	29.9	5.66	11.39	20.06
Homemade F	1.273	30.9	4.40	13.09	21.02
Homemade G	1.253	29.1	4.78	14.34	19.07
Homemade H	1.242	28.1	2.65	14.35	20.80
Commercial I	1.305	34.0	1.25	18.91	25.84
Commercial J	1.3045	34.0	1.06	19.14	25.90

The homemade lime-sulfur solutions are, so far as known, equal in every respect to the commercial except for the fact that it is imperative to test the gravity at least of the concentrate, in order to make a proper dilution for use. Both the preparation of the concentrated solution and its testing with a spindle or hydrometer are comparatively simple operations and their feasibility is illustrated by the fact that this year more homemade concentrate was produced by users than in recent years.

PARIS GREEN, STEARATED.

Water soluble arsenic (metallic)	.30%
Total metallic arsenic	27.38%
Moisture	31.84%
Copper soap	3.20%
Total copper oxid in form of Paris green	19.85%

Practically the mixture consisted of

Commercial Paris green	66.46%
Moisture	30.34%
Copper soap	3.20%

Copper soap as it occurs in the pasty material is not considered by this laboratory as an injurious substance and if it does impart better adhering qualities, as the makers claim, it may be a helpful ingredient. In the purchase and use of the material it should be borne in mind that it contains nearly one-third (30.34 per cent) water and calculations should be made accordingly.

ROACH POWDER.

Consisted of sodium fluoride and a powdered plant material, probably pyrethrum. Both of these materials are of value.

SOLUBLE SULFUR COMPOUND.[1]

A powdered material consisting of soda and sulfur in the following forms:

Total sulfur	57.09%
The sulfur being in the following forms:	
Sulfur, free	1.33%
Sulfur, as thiosulfates	18.19%
Sulfur, as sulfates and sulfites	0.63%
Sulfur, as sulfide	36.51%

ATOMIC SULFUR.

Total sulfur	48.69%
Moisture	45.67%
Ash	2.52%

This pasty material is a convenient commercial preparation for the application of finely divided sulfur. The activity depends on the free sulfur present and other materials cause this sulfur to be easily suspensible in the spray and to adhere well.

TIZIT.

	Sample A	Sample B
Sodium carbonate	16.64%	11.66%
Soap	15.39%	11.59%
Free sulfur	18.49%	19.71%
Total arsenic (as As_2O_5)	4.77%	5.39%

This complex material also evidently contains arsenic in the water soluble (harmful) condition. From the chemical and physical examination the paste appears to be composed of lead arsenate, soap powder and a sulfur paste. Mixtures of this type may be spoken of as "shotgun" sprays and appear periodically upon the market.

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[1] Analyzed by a method adapted from that for lime-sulfur solutions.

CALIFORNIA SCALE SPRAY.

Water	98.88%
Solids	1.11%

The solids having the following composition:

Soap	70.77%
Sodium carbonate	8.08%
Sodium fluoride[2]	13.23%
Small quantities of silica, calcium, iron and aluminum salts.	

From the analysis this material appears to be practically a spray composed of:

Dry soap	8.5 pounds
Sodium fluoride	1.25 pounds
Water	100 gallons

Comment on the solution, on account of the large volume of water composing it, is scarcely necessary.

SHURE-KIL.

A milky looking fluid with a slight reddish tinge, having an odor of distillate. It has the peculiar property of not wetting glass or tin. After standing a few hours a slight separation of oily drops is noticed on the surface. The emulsion is not broken by copious dilution with water, but is broken by the addition of a strong acid, strong alkali, or brine. The material contains approximately 50 per cent of total oils. The emulsifier appeared to be a sulfonated oil.[3] Examination of the oil separated from the emulsion gave the following results:

Specific gravity at 17° C.	.878
Equivalent to 29° Be. at 60° F.	
Flash test	128° F.
Sulfonatable oils[3]	50%

TRIUMPH.

A dark brown clear liquid. With water forms a very good milk-white emulsion. Has strong odor of cresol.

Examination of the separated oil gave the following results:

Total oils	76.00%
Total phenols	5.25%
Sulfonatable oils	33.50%
Specific gravity of separated oils at 60° F.	.881
Equivalent to 28.9° Be. at 60° F.	

The material appears to be a "miscible oil" made from a distillate of about 30° Be. gravity, and a cresol soap.

PYROX.

A light blue homogeneous paste containing moisture, 6.47 per cent.

Analysis of the air-dried powder gave the following results:

Total lead (calculated as PbO)	43.15%
Total copper (calculated as CuO)	7.10%
Total arsenic (calculated as As_2O_5	20.50%
Water soluble arsenic (calculated as As_2O_5)	.20%

It appeared to be composed of acid, lead arsenate and Bordeaux Mixture.

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[2] The laboratory has received many reports of severe foliage and fruit injury resulting from the use of sodium fluoride as a spray, and on the other hand, there are cases in which no injury has been noted following its use.

[3] A sulfonatable oil is the term applied to an oil which is soluble in fuming sulfuric acid. Experiments have shown that oils of this nature are much more injurious to foliage than those which are not soluble in the acid.

A sulfonated oil is an oil similar to the above, but which is already combined with the acid and has great emulsifying properties, but is believed to be very injurious to foliage.

YELLOW STAR THISTLE.

(Centaurea solstitialis.)

By O. W. Newman.

The yellow star thistle has been known in California for the past 40 years, and during that time has spread throughout the Sacramento Valley, and is becoming, with its lesser relative, the Napa thistle, a very serious menace to the grain areas of the state. It is found also in the San Joaquin Valley and in parts of southern California, but it has not as yet become a recognized pest in these regions. It is spreading with great rapidity, especially along the main arteries of travel, and unless some definite control action is undertaken the same condition may arise in this state which occurred in the Dakotas in the year 1892 over Russian thistle. The following quotation from Bulletin 15, United States Department of Agriculture, 1894, will show what the situation was in those states:

> "In the badly infested areas more than 940,000 acres are devoted to wheat raising. The average loss on this land, which may be attributed to the Russian thistle alone, can not be less than five bushels per acre; and 3,200,000 bushels at the minimum price of 50 cents per bushel (which is considerably less than the average price) indicates a loss to the farmers in the Dakotas of $1,600,000. The loss in other crops, the injuries caused by the spines, and the fires caused by the plants jumping fire breaks, will bring the total loss to something more than $2,000,000 for the year 1892."

Yellow star thistle, *Centaurea solstitialis,* is a naturalized weed brought over from Europe at a very early date. Dr. William Darling-

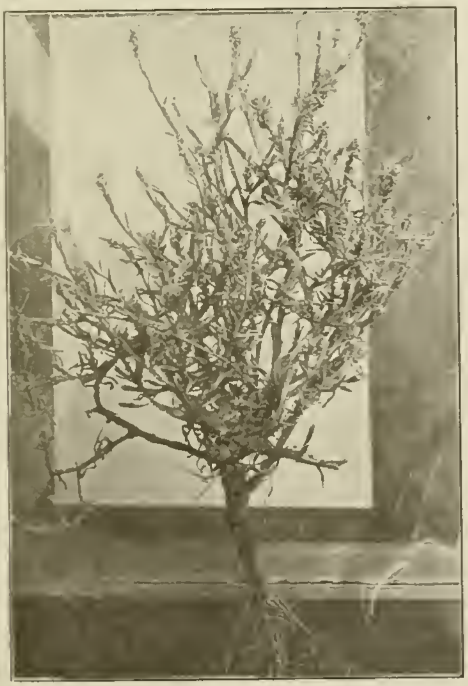


Fig. 6.—Yellow star thistle showing the spines, leafless stems and the long, thick taproot. This thistle often reaches a height of four feet. (Original.)

ton reports several species of Centaurea in his "Agricultural Botany," published in New York in 1847, his yellow star thistle variety being called *Centaurea calcitrapa.* At this time the thistles were spread over parts of New England and south to the Virginias.

The earliest records of the flora of California report star thistle around San Francisco Bay, evidently brought here by the early settlers. The Botanical Survey of California, published in 1880, reports it also as appearing in Sonoma County. From that time to date it has spread with ever increasing rapidity.

METHODS OF DISSEMINATION.

Yellow star thistle is spread by seed only, as it is an annual plant. This seed is very prolific and of high germinating quality. Seed will live in the ground for three or four years and germinate readily when turned to the surface. The seed is a common impurity in alfalfa and other agricultural seeds. It is found in baled hay, in straw packing materials, and in sweepings from grain and stock cars. It is transported by the wind, by traveling stock, by the annual overflow of streams, in irrigating ditches, and along rights of way. Even the birds carry seeds.

CONTROL.

As stated before sow clean seed and demand clean hay—nothing will so soon bring about a change for the better in our agricultural practice as this drastic demand. In Sacramento, this winter, a man made the statement in public that his hay the past season contained fully 50 per cent yellow star thistle, and that he had buyers who were eager to take it off his hands at the top of market price. It does not seem possible that farmers could be so dull and thoughtless as to buy such stuff. The purchasers must have been big wholesale men, but nevertheless much of that hay and more of its like is going back to the farm every day.

Under ordinary conditions it is not a difficult matter to control yellow star thistle. Stockyards and sidings where hay or stock cars are cleaned should be watched, and no thistles should be allowed to grow. This can easily be handled by monthly inspection. Traveling stock should be confined to certain stated highways and road supervisors should keep these, and all other roads and highways, free from weed pests. How it is done is of little consequence, as long as it is done. As a general rule mowing twice during the summer and burning the brush will be found the most effective method. The state highway commission has undertaken this method of weed removal with great success. Roadsides and waste places might be harrowed some time during the fall and seeded to sod forming grasses. These can be broadcasted at small expense and will not only serve to keep the thistles down, but will also supply good pasturage for the following year. Railroads and other owners of rights of way should be required to keep these places clean. It has been the writer's experience that the railroads are ready and willing to keep their rights of way free from noxious pests when they are shown the necessity for such work.

On waste land as well as on cultivated lands there should be one object in regard to yellow star thistle control, which should be perfectly clear: try wherever possible to prevent plants from going to seed. Mow waste lands where it is possible two or three times during the summer; this will not kill the weed, because it will sprout from the cut stalk and grow close to the ground, but it will be better than nothing, and will prevent such enormous seed development as would otherwise occur. Grain fields should be disked and harrowed as soon as possible after the crop is harvested. This will kill many thistles and retard the growth of others. Another harrowing later in the summer will prevent subsequent growth from maturing seed.

OVERFLOW LANDS.

On lands annually covered by winter overflow these control measures will not prove entirely satisfactory, though they will materially aid in keeping the weed down. For such lands an entirely new system must be devised. Millions of seeds are carried annually from the watersheds and waste lands onto the rich river bottom lands. To devise ways and means of meeting a problem of this nature, and to get the best results from any control measures which might be attempted, united effort is absolutely essential. It is important that this weed be prevented from spreading by all means at our command. If allowed to go unchecked it may cause millions of dollars damage to our agricultural crops. It is interesting to note that California is the only state in the union which has reported yellow star as a serious pest. It has, however, been known to do great damage in Europe, being most serious in the grain fields of Russia.

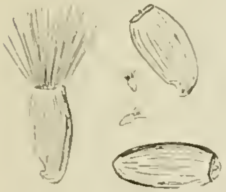


FIG. 7.—Seeds of yellow star thistle showing the characteristic notch just above the lower end. The seeds are slightly longer than broad, with a point in the center of the larger end where the pappus is attached. The color is cream-white with a few light brown lines. (Original.)

We have, therefore, no precedents in this country to show us the most practical and efficient means of control. The rough hillsides, waste land, and cheap agricultural lands present a problem worthy of considerable thought and study.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical and other publications of a similar nature.

G. H. Hecke, State Commissioner of Horticulture------------------------Censor
E. J. Vosler, Secretary State Commission of Horticulture-------------------Editor

ASSOCIATE EDITORS.

Geo. P. Weldon-------------------------------Chief Deputy Commissioner
Harry S. Smith------------------------------Superintendent State Insectary
Frederick Maskew---------------------------Chief Deputy Quarantine Officer

Entered as second class matter December 29, 1911, at the post office at Sacramento, California, under the act of June 6, 1900.

Concerning Our Printing Fund.—The steadily increasing price of paper has caused a shrinking in the size of The Monthly Bulletin, which is printed and issued under the regular printing appropriation provided the State Commission of Horticulture. We have, however, the recommendation of the State Board of Control for an increase in our printing appropriation commensurate with the added cost of printing, becoming available the next biennial period if passed by the legislature.

The scarcity of dyes has been the cause of changing the cover of our little magazine, and the well-known rich buff color has had to give way to a much paler and less attractive one.

The valuable reports of the State Fruit Growers' conventions were formerly—until 1913—issued by the state, but for lack of funds in the printing appropriation, no reports have since been issued except those of three annual conventions prior to the one held at Napa on November 15–17, 1916. These were published under agreement with commercial agencies. The parties securing the contract arranged to obtain the necessary funds by selling advertising space in the publication. This method has not been satisfactory. Primarily, the publishers were obliged to work on the generosity of our friends in order to secure many of the necessary advertising contracts, and again, misrepresentation of facts has been charged by some of the larger advertisers.

It is evident that the state should not be a party to questionable commercial methods, and we trust that in time to come we will have sufficient funds for the publication of convention reports so that we may be able to keep intact and complete the long series beginning with the first fruit growers' convention held in Sacramento December 6, 1881, and continuing in a practically unbroken line until 1915. They furnish a continuous history of horticultural events and contain valuable essays and discussions given by the ablest horticulturists of their time. We do not know now how to obtain the funds with which to publish the report of the Napa convention, for which many applications have begun to arrive. We may, however, try to publish the more valuable discussions and papers of this meeting by combining two issues of THE MONTHLY BULLETIN into one. This, of course, would be but a makeshift, and an undesirable one at that, which will be adopted only in case of absolute necessity.—G. H. H.

Quarantine Order No. 29 on the Alfalfa Weevil.—The revocation of Quarantine Order No. 20, on the alfalfa weevil by the passage of Quarantine Order No. 29, on December 29th, when it was signed by Governor Johnson, is a step that has been contemplated ever since the conference of quarantine officers of seven western states was held in Salt Lake City on April 20–21, 1916. This conference convened as a result of a call issued by Governor William Spry of Utah, who requested the governors of other interested states to appoint delegates to the meeting. At this meeting it was learned that certain features of Quarantine Order No. 20 were, in the light of facts discovered since its passage, undesirable at the present time. The delegates were unanimous in their opinion that some essential points had been overlooked in the drafting of this order. The present order eliminates all the unnecessary and undesirable features of No. 20, and in addition provides for restrictions that are new. The total absence of any evidence that either bees in the hive or alfalfa seed imported from Utah, or the counties of Idaho and Wyoming, where the weevil is known to occur, constituted a menace, resulted in these two items being stricken from the quarantined or restricted list, and it is now lawful for bees to be brought from Utah to California or alfalfa seed to be imported without fumigation. The regulations regarding potatoes and agricultural emigrant movables materially strengthen our quarantine against the affected states. Potatoes constitute the greatest menace, as live weevils have been found upon different occasions in shipments of potatoes into Montana where no precautionary measures were used in handling previous to shipment.—G. P. W.

CALIFORNIA STATE COMMISSION OF HORTICULTURE QUARANTINE ORDER No. 29.

(With Regulations)

ALFALFA WEEVIL.

The fact has been determined by the State Commissioner of Horticulture that an insect injurious to alfalfa, known as the Alfalfa Weevil (*Phytonomus posticus*), new to and not heretofore prevalent or distributed in the state of California, exists in the state of Utah and in certain counties in the state of Idaho, to wit: Cassia, Bingham, Bear Lake, Oneida, Bannock, Franklin and Power, and in certain counties in the state of Wyoming, to wit: Sweetwater, Uinta and Lincoln.

Now, therefore, it is declared necessary, in order to prevent the introduction of the alfalfa weevil into the state of California, that a horticultural quarantine be and the same is hereby established at the boundaries of the state of California, in accordance with the provisions of section 2319*b* of the Political Code of the state of California, against all alfalfa and other hay and cereal straw, agricultural emigrant movables, live stock, potatoes and nursery stock, except as hereinafter provided.

Regulation 1. Alfalfa hay and other hays of all kinds and cereal straws that have been grown or stored in the state of Utah or in the counties in the states of Idaho and Wyoming aforementioned in this order, are hereby prohibited from entering the state of California for any purpose whatsoever, and upon the arrival of any such hay or straw as quarantined against in this order, the same shall be immediately sent out of the state or destroyed at the option and expense of the owner or owners, his or their responsible agents.

Regulation 2. Potatoes grown in the aforementioned state and counties where the alfalfa weevil is known to exist will be admitted into the state of California only when accompanied by an official certificate signed by the state inspection officer of the state in which such shipments of potatoes originate, setting forth that the potatoes in the shipment have been passed over a screen, placed in fresh, clean sacks, and packed in cars that are free of alfalfa hay or other hays and cereal straws.

Regulation 3. All nursery and ornamental stock and other plants imported or brought into the state of California from the aforementioned state and counties, must be packed in fresh shavings, excelsior or other suitable packing (except tule, hay or straw), and that each shipment must be accompanied by an official certificate setting forth that each package in the shipment has been fumigated for a period of one hour for alfalfa weevil in an air-tight enclosure, subsequent to being boxed, baled or packed for shipment, with cyanide of potassium or sodium at the rate of one ounce to each one hundred cubic feet of space.

Regulation 4. All agricultural emigrant movables imported or brought into the state of California from the aforementioned state and counties must be accompanied by an official certificate of inspection made under oath and setting forth that such agricultural emigrant movables as enumerated in the certificate have been inspected and found to be free and clean of alfalfa hay, all other kinds of hays and cereal straw, at time of departure or shipment.

Regulation 5. Railroad cars that have been used for the transportation of live stock in or through any part of the state of Utah or the counties in the states of Idaho or Wyoming aforementioned in this order must be clean and free of alfalfa hay, all other kinds of hay or cereal straw before entering the state of California.

All deputies of the State Commissioner of Horticulture or State Quarantine Guardians are hereby empowered to carry out all the provisions of this order.

This order supersedes Quarantine Order No. 20, issued February 27, 1913.

G. H. HECKE,
State Commissioner of Horticulture.

Approved:
Hiram W. Johnson,
Governor of the State of California.
Dated, December 29, 1916.

Cost of Controlling Citrus Canker.—Upon an inquiry by the state commissioner of horticulture directed to the chief of the Bureau of Plant Industry, U. S. Department of Agriculture, to ascertain the cost of the attempted control of citrus canker in Florida, Assistant Chief Kellerman wired as follows:

> *G. H. Hecke,*
> *Commissioner of Horticulture,*
> *Sacramento, California.*
>
> Federal appropriation for citrus canker, 1915, $35,000; 1916, $550,000; Florida legislature, $195,000; Florida citrus interests, $100,000; estimated total cost this year, $600,000.
>
> (Signed) KELLERMAN.

This means that the initial cost of attempted control in 1915 was $35,000, and in 1916 a total of $845,000, divided as follows: Federal government, $550,000; Florida legislature, $195,000; citrus interests, $100,000. The cost for 1917 is estimated at $600,000.

It is not necessary to use superlative language to impress upon us the necessity of maintaining the most careful watch in the citrus districts of California. For fear, that in spite of our strict quarantine order, enforced by diligent inspection, some infested fruit or plant might slip through the quarantine in the baggage of transcontinental travelers, and start citrus canker in California, suspicious infestations of a bacterial nature should be immediately reported to the State Commission of Horticulture.—G. H. H.

An Australian Expedition From the Insectary.—In the last number of the Bulletin notice was given of a conference to be held in the Salinas Valley for the purpose of considering parasite introduction in connection with the control of the beet leaf-hopper, the insect carrier of the disease known as beet blight or curly top. To the sugar people the problem is a serious one, so much so that they are willing to go into their own pockets in order to furnish funds for starting the parasite work at once. For various reasons Australia has been selected as the best part of the world to work first, and Mr. E. J. Vosler, on account of his former experience in the handling of parasitic insects at the Insectary and in the U. S. Bureau of Entomology, has been chosen to make the exploration. He will sail on January 30th.—H. S. S.

Two New Pests to Be Watched For.—Notice has recently been published by the U. S. Department of Agriculture, of the discovery in the eastern United States of a new enemy of the peach, believed to have been introduced from Japan. This insect is a moth technically known as *Laspeyresia molesta*. It is stated that the presence of the insect can best be determined by the nature of its injury to peach trees.

"It bores into practically every tender twig and causes new shoots to push out from lateral buds. These are attacked in turn, the abnormal stimulation of lateral growth producing a much branched and bushy plant. A copious flow of gum from the twig ends often follows the attack of the caterpillars. In attacking fruit the young caterpillars generally eat through the skin at or near the point of attachment of the fruit stem. The larva as it grows makes its way to the pit, where it feeds on the flesh which soon becomes much discolored and more or less slimy."

It is stated that owing to the habits of the caterpillars the usual arsenical sprays will probably not be effective. County commissioners are requested to be on the lookout for this pest and fruit growers also will confer a favor on the State Commissioner of Horticulture if they will keep a watch for this destructive insect. It is possible that it will also attack plum, cherry or almond trees. Specimens of work thought possibly to be that of this insect should be forwarded to the State Insectary.

The other new pest is a fungous disease of poplars and cottonwoods, known as the European poplar canker. It attacks the twigs, limbs and trunks of practically all the poplars and cottonwoods. The effect of the disease is described as follows:

"It appears first in the form of cankers or depressed dead areas in the bark, much in the same manner as in case of the blight of chestnut trees which is caused by a distinctly different fungus. Cankers are formed on the point of attack, spread rapidly and often girdle the twigs, limbs or trunk at the point of attack, killing the part above the canker. Trees attacked on the trunk become 'spike-topped.' The death of limbs and twigs gives the trees a ragged appearance which spoils their beauty and later kills them. This is especially the case with black poplars which are frequently planted in rows along boulevards and avenues."

It is said that the disease is even more severe on nursery stock, these being readily attacked by the fungus and ruined within a very short period of time.

The disease is said to be prevalent in small areas of the following states: New Hampshire, Massachusetts, Rhode Island, Connecticut, New Jersey, Pennsylvania, Delaware, Maryland, Ohio, Nebraska and New Mexico.

It would be very desirable to obtain additional information as to whether this disease occurs in California, and owners of diseased poplar and cottonwood trees are requested to notify the Horticultural Commission and to send in specimens.—G. H. H.

Concerning Hippodamia convergens.—For several years now the State Insectary has been shipping out each season an enormous number of the very valuable red ladybird, *Hippodamia convergens*. These insects congregate for hibernation in large quantities in the mountain canyons which renders their collection a comparatively easy matter. This work has not been developed to the limit, however, for the reason that we have never known just how much good we were accomplishing by this artificial handling. The question has not been investigated, mainly on account of lack of time and assistance. We believe that a thorough study of this ladybird in the mountains, fields and laboratory will enable us to measure in at least an approximate way just what from a practical standpoint is accomplished by the work, so that it may be conducted in a more intelligent manner in the future. We have arranged to take up this study during the coming year, in cooperation with the U. S. Department of Agriculture, and the Bureau of Entomology has kindly located Mr. W. M. Davidson at the Insectary for the purpcse of studying this problem along with others concerning predaceous insects.—H. S. S.

COUNTY COMMISSIONERS DEPARTMENT.

DEPUCKERIZING THE PERSIMMON.

By O. E. Bremner, Horticultural Commissioner, Sonoma County.

We noted with considerable interest Mr. Sumito Fujii's article on the persimmon in the September issue of the Monthly Bulletin. One item, however, seemed to be omitted and that is the method by which a persimmon is ripened that removes its astringent properties. The Japanese have a method, the origin of which, as with all other such processes that have been handed down from generation to generation, is probably unknown. They take a soy tub which has just been emptied of the soy and fill it with persimmons, covering the top tightly. After a few weeks the persimmons are removed perfectly ripe and without the astringent property. Mr. Roeding tried this process but says it is not practical on account of the difficulty in securing fresh soy tubs.

The soy tub and the soy are not essentials to the process, although the Japanese believe they are. A simple manner and one perfectly effective is to place the persimmons in layers of chaff or fine straw or hay in the boxes so as to exclude the light. The fruit will ripen in from two to six weeks, depending on its condition when picked. They may be gathered even before they have begun to take on the yellow color and yet ripen so perfectly that they may be eaten like apples without even removing the skin. This is not strictly true of some of the seedlings, but does refer to the varieties mentioned in Mr. Fujii's article.

It is not essential to the ripening of persimmons that they remain on the tree until slightly frosted. The longer they remain on the tree the higher the color and the quicker they ripen. We usually put away about five lug boxes, each containing two or three layers of persimmons, according to the size of the fruit. When cured this way persimmons make an elegant appetizer served either with cream or without.

REGARDING NURSERY STOCK.

We are giving herewith a letter from Mr. W. H. Volck, horticultural commissioner of Santa Cruz County, which we believe will be of interest to his fellow commissioners:

Watsonville, California, December 14, 1916.

Mr. G. H. Hecke,
State Commissioner of Horticulture,
Sacramento, California.

Dear Sir: I have nearly completed the examination of a number of shipments of nursery stock from three leading Oregon nurseries. I regret to report that the condition of this stock averages very poor. This is especially true of the apricots.

The trouble with the apricots appears to be a fungous infection producing gummosis and cankers on the roots, crown, trunk, and graft union. A few of the cankers were found on the tops as well. In the worst cases the cankers have killed the bark on the trunk near the crown. Many infections were also found at the graft union, and some of these had already killed the greater portion of the bark at this point. One shipment of apricots on apricot roots showed the above mentioned cankers and, in addition, dead roots which were apparently due to the same disease.

A microscopic examination of material from these cankers shows the presence of a fungous mycelium in considerable abundance.

Four of these shipments have been rejected on account of the abundance of the above described cankers. Three other shipments, which were in much better condition, have been passed after carefully sorting out the few trees which showed traces of this trouble.

Other varieties of trees in these shipments were in fair condition with the exception of some apples which appear to have had woolly aphis infestations on the roots. Also, much of the stock is on two to three year old roots with poor healing over the stub of the second graft union.

W. H. Volck.

QUARANTINE DIVISION.

Report for the Month of November, 1916.

By Frederick Maskew.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	78
Passengers arriving from fruit fly ports	2,547

Horticultural imports:

	Parcels
Passed as free from pests	150,466
Fumigated	1,722
Refused admittance	920
Contraband destroyed	15
Total parcels horticultural imports for the month	153,123

Pests Intercepted.

From Belgium:

Larvæ of leaf miner, *Thrips* sp., and *Aleyrodes* sp. on azaleas.
Trioza alacris, Aspidiotus britannicus, Aspidiotus hederæ and *Coccus hesperidum* on bay trees.

From Central America:

Selenaspidus articulatus and *Aspidiotus* sp. on bananas.
Larvæ of Weevil, in avocado seeds.

From China:

Cladosporium citri and *Parlatoria ziziphus* on oranges.
Cylas formicarius in sweet potatoes.
Calandra oryzæ in rice.

From Colombia:

Diaspis boisduvalii on orchids.

From Costa Rica:

Lepidosaphes beckii on oranges.

From Hawaii:

Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Coccus longulus on betel leaves.
Chrysomphalus aonidum, Hemichionaspis minor and *Pseudococcus* sp. on bananas.
Trypetid larvæ in string beans.
Cryptorhynchus batatæ in sweet potatoes.
Lepidopterous larvæ in dates.
Lepidosaphes beckii on oranges.

From Holland:

Larvæ and pupæ of *Merodon equestris* in narcissus bulbs.

From Japan:

Larvæ of Weevil in chestnuts.
Coccid on oranges.
Lepidopterous larvæ in Chili peppers.
Fungus on pomelos.
Lepidopterous larvæ in pine cone.

From New Jersey:

Isosoma orchidearum in orchids.

From Pennsylvania:

Pseudococcus sp. on gardenia.

LOS ANGELES STATION.

Ships inspected	30

Horticultural imports:

	Parcels
Passed as free from pests	122,553¾
Fumigated	7¾
Refused admittance	7½
Contraband destroyed	8
Total parcels horticultural imports for the month	122,577

Pests Intercepted.

From Belgium:

Aleyrodes sp. on azaleas.

From Florida:

Chionaspis sp. on pineapple plant.
Saissetia oleæ on avocado stem.

From Holland:

Lepidosaphes ulmi on Buxus.

From Japan:

Unidentified weevils on chestnuts.

From Maryland:

Aspidiotus perniciosus and *Cydia pomonella* on apples.

From Mexico:

Lepidopterous larvæ on dates.
Lepidosaphes gloverii on limes.

From Mississippi:

Aleyrodes citri on gardenia shrubs.

From New York:

Diaspis boisduvalii and *Eucalymnatus perforatus* on orchids.
Aspidiotus perniciosus on apples.
Pseudococcus citri on Otaheite orange.
Aspidiotus lataniæ on *Jasminum primulinum.*

From Pennsylvania:

Pseudococcus sp., on begonias, coleus, cyclamens, fuschias and spirea.

From Utah:

Scab on potatoes.

From Washington:

Rhizoctonia on potatoes.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	19
Fish boats	31
Passengers arriving from fruit fly ports	116

Horticultural imports:

	Parcels
Passed as free from pests	15,246
Fumigated	66
Refused admittance	2
Contraband destroyed	4
Total parcels horticultural imports for the month	15,318

Pests Intercepted.

From Mexico:

Lepidosaphes beckii and *Lepidosaphes gloverii* on oranges.

From Pennsylvania:

Dialeurodes citri on *Citrus* sp.
Pseudococcus sp. on ornamental plants.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	10

Horticultural imports:

	Parcels
Passed as free from pests	28
Refused admittance	1
Total parcels horticultural imports for the month	29

Pests Intercepted.

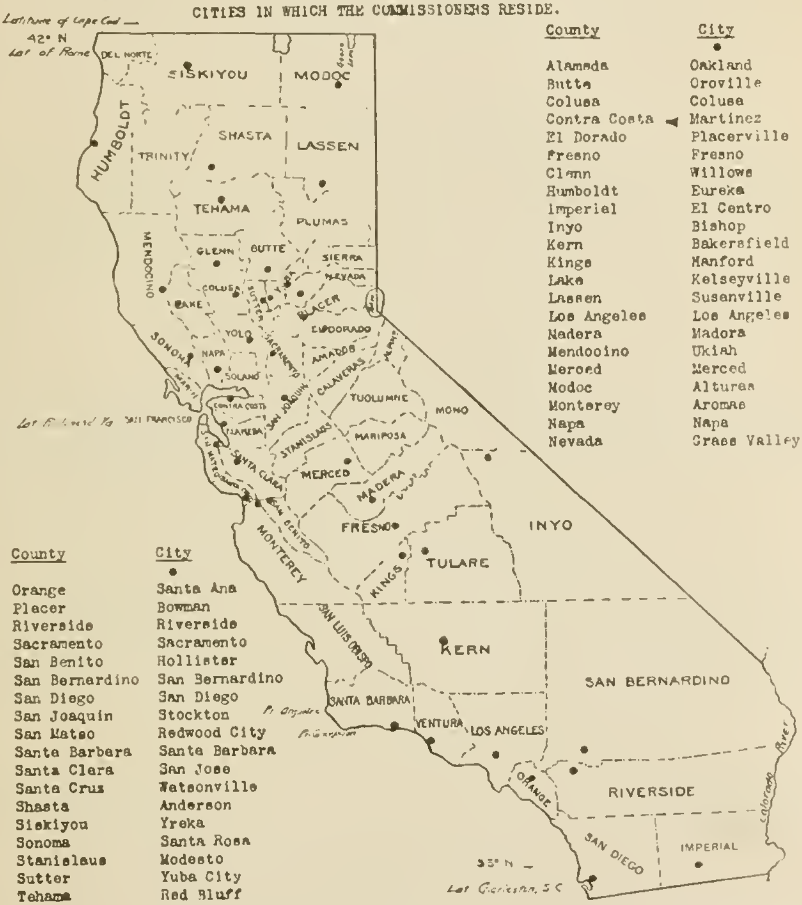
From Holland:

Merodon equestris in bulbs.

SANTA BARBARA STATION.

(No report.)

COUNTIES HAVING HORTICULTURAL COMMISSIONERS, WITH THE RESPECTIVE CITIES IN WHICH THE COMMISSIONERS RESIDE.


Latitude of Cape Cod —
42° N
Lat of Rome
DEL NORTE
SISKIYOU
MODOC
Goose Lake
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
NEVADA
COLUSA
SUTTER
YUBA
LAKE
PLACER
EL DORADO
YOLO
SONOMA
NAPA
SACRAMENTO
AMADOR
ALPINE
SOLANO
MARIN
CALAVERAS
CONTRA COSTA
SAN JOAQUIN
TUOLUMNE
MONO
SAN FRANCISCO
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CRUZ
SANTA CLARA
MERCED
MADERA
SAN BENITO
FRESNO
INYO
MONTEREY
KINGS
TULARE
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
Pt. Arguello
Pt. Conception
VENTURA
LOS ANGELES
ORANGE
RIVERSIDE
Colorado River
SAN DIEGO
IMPERIAL
33° N —
Lat Charleston, S C

County	City ●
Alameda	Oakland
Butte	Oroville
Colusa	Colusa
Contra Costa ◀	Martinez
El Dorado	Placerville
Fresno	Fresno
Glenn	Willows
Humboldt	Eureka
Imperial	El Centro
Inyo	Bishop
Kern	Bakersfield
Kings	Hanford
Lake	Kelseyville
Lassen	Susanville
Los Angeles	Los Angeles
Madera	Madera
Mendocino	Ukiah
Merced	Merced
Modoc	Alturas
Monterey	Aromas
Napa	Napa
Nevada	Grass Valley

County	City ●
Orange	Santa Ana
Placer	Bowman
Riverside	Riverside
Sacramento	Sacramento
San Benito	Hollister
San Bernardino	San Bernardino
San Diego	San Diego
San Joaquin	Stockton
San Mateo	Redwood City
Santa Barbara	Santa Barbara
Santa Clara	San Jose
Santa Cruz	Watsonville
Shasta	Anderson
Siskiyou	Yreka
Sonoma	Santa Rosa
Stanislaus	Modesto
Sutter	Yuba City
Tehama	Red Bluff
Tulare	Visalia
Ventura	Ventura
Yolo	Woodland
Yuba	Marysville

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1917

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THE MONTHLY BULLETIN

Canada Thistle, *Cirsium arvensis.*

OF

STATE COMMISSION OF HORTICULTURE

SACRAMENTO, CALIFORNIA FEBRUARY, 1917

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THE MONTHLY BULLETIN.

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VI. February, 1917. No. 2

SOME OBSERVATIONS UPON THE RELATION OF HUMIDITY TO THE RIPENING AND STORAGE OF FRUITS.

By A. D. Shamel, U. S. Department of Agriculture.

For the past three years, 1914 to 1916, inclusive, the writer, in cooperation with Mr. Frank F. Chase of Riverside, California, has made some observations of the effect of different conditions of relative humidity upon the ripening and curing of lemons held in storage.

The experiments have been conducted in the National Orange Company's lemon storage and packing house at Corona, California. In this building there are twenty rooms, each containing about 8,000 cubic feet of space. These rooms are insulated by means of a four-inch filling of pine shavings between galvanized iron walls. Beneath each room is a basement. The floors of the rooms over the basement are made of pieces of wooden two by fours arranged with cracks between them about one-half inch wide. In the basements of five of the rooms steam radiators have been provided, connected with an outside heating plant, so that the temperature of the air in the rooms can be raised to a maximum of about 135 degrees Fahrenheit. Ventilating doors have been arranged in the lower outside walls of the rooms and in the upper inside walls, in such positions that the air in the rooms can be quickly changed when desired. Special humidifiers have been provided for raising the relative humidity of the rooms when needed, so as to maintain, with ventilation, any condition desired. While the insulation of the rooms has been found to be imperfect, a reasonably effective control of the conditions of temperature and relative humidity has been secured by means of ventilation, steam heat and the special humidifiers.

In an experimental curing of a roomful of lemons, with the room maintained for four weeks at about 90 degrees Fahrenheit and about 90 per cent relative humidity, more than 90 per cent of the cut stems of the fruits calloused over perfectly in the same manner as is sometimes the case with cuttings under favorable conditions. While this condition had been observed before in isolated cases of lemons cured under good storage conditions, it was the first time, in the writer's knowledge, where any such large proportion of the fruits developed this callous.

In further experiments, where the rooms of lemons were held at different temperatures and different conditions of relative humidity, it was discovered that the development of the calloused condition depended largely on the maintenance of a uniform condition of relative humidity. It was also found in these experiments that the callous developed more rapidly under a high temperature of about 95 degrees Fahrenheit, than under a low temperature of about 60 degrees Fahrenheit. It was demonstrated that under fluctuating conditions of relative humidity,

28404

e. g., varying from about 50 per cent to about 95 per cent daily, due to ventilation or other causes, very little development of the callous was observed.

It was also found that with a condition of uniformly high relative humidity, *e. g.*, about 90 per cent, comparatively little loss of weight in the cured fruits was observed, irrespective of the temperature during storage. For instance, in the rooms where the high relative humidity was maintained the loss in the weight of the fruits, from the time when they were stored until they were cured, was about two and one-half per cent per month. Under natural conditions of storage, *i. e.*, where the condition of relative humidity frequently varied from about 60 to about 90 per cent, the loss in weight of fruits was about five per cent per month. The temperature of the air in both cases was the same and the curing process in both cases took place in about the same length of time.

It was further observed in the course of these experiments that the lemons which had been cured under uniform conditions of high relative humidity, *e. g.*, 90 per cent, developed a smoother texture, lighter color, and better commercial appearance than those where a condition of low relative humidity, *e. g.*, 70 per cent, was maintained, or where the condition of relative humidity fluctuated over a considerable range during the periods of storage.

On August 4, 1916, Mr. Chase placed in one of the rooms, which was partly filled with lemons undergoing the curing process, a box of hard, ripe Bartlett pears. The conditions of temperature and relative humidity in this room during the period of pear storage is shown in the accompanying table.

DAILY MAXIMUM.

Conditions of Temperature and Relative Humidity During the Period of Bartlett Pear Storage.

Ventilated for about one-half hour daily for a number of days following August 16, reducing both temperature and humidity, the relative humidity going as low as 54 per cent, but on closing the vents the temperature and humidity came back almost immediately.

Date	Temperature, Fahrenheit	Per cent relative humidity	Date	Temperature, Fahrenheit	Per cent relative humidity
August 4, 1916	85	81	August 19, 1916	92	91
August 5, 1916	84	85	August 20, 1916	92	87
August 6, 1916	83	88	August 21, 1916	92	89
August 7, 1916	85	88	August 22, 1916	90	76
August 8, 1916	85	90	August 23, 1916	95	70
August 9, 1916	87	90	August 24, 1916	95	70
August 10, 1916	89	92	August 25, 1916	95	68
August 11, 1916	90	92	August 26, 1916	96	75
August 12, 1916	94	94	August 27, 1916	100	80
August 13, 1916	95	93	August 28, 1916	98	82
August 14, 1916	94	95	August 29, 1916	91	77
August 15, 1916	94	93	August 30, 1916	86	79
August 16, 1916	95	93	September 1, 1916	79	77
August 17, 1916	90	96	September 2, 1916	79	84
August 18, 1916	93	92	September 3, 1916	83	77

It will be observed that in the beginning of this experiment the temperature was as low as 83 degrees Fahrenheit on August 6th. For the most part after this date until August 29th, the temperature was very high, reaching 100 degrees Fahrenheit on August 27th. The relative humidity was uniformly high, being 96 per cent on August 17th. From August 5th to August 21st it ranged between 85 per cent as a minimum and 96 per cent as a maximum. In 12 days out of the 30, it was 90 per cent or above, and during the remainder of the time it was higher than has been usually considered to be the best condition for the storage of lemons.

At the time that the pears were placed in this room, some of the same lot were placed in an adobe room of a dwelling house, where fruits and vegetables are commonly kept temporarily for family use.

The pears in the family storage room, where no attempt was made to control either the conditions of temperature or relative humidity, ropened perfectly and were eaten within a week, or by August 10th. These pears turned in color from green to a golden-yellow, became soft, and reached a prime ''eating'' condition.

The pears in the lemon room remained hard and retained their green color until the end of the experiment on September 3d. So far as the observations of a number of interested persons went, some of them experienced deciduous fruit growers, there was no apparent change in the pears from the day they were placed in the lemon room on August 4th until they were taken out on September 30th, or a total storage period of 30 days.

From time to time, during this experiment, several of the pears were taken out of the lemon room and placed in the kitchen and the living room of a dwelling. Those remaining in the lemon room at the end of the storage period were removed and held under similar conditions. Within six or seven days from the date of withdrawal these pears ripened perfectly, and their eating quality was as good as those ripened in the adobe room.

It is almost unbelievable that pears can be held for 30 days at the high temperatures recorded without ripening or deteriorating. While no definite conclusions have been drawn as to the cause of this, both Mr. Chase and the writer believe that the condition of high relative humidity was a controlling factor in retarding the ripening of the pears.

One of the reasons for reaching this belief has been the repeated experience in the lemon-curing house of finding that the ''buttons,'' (the calyx) of lemons held under conditions of high relative humidity retain their original green color and living condition even during very long periods of storage. The extraordinary condition of calloused stems, and the perfect preservation of the ''buttons,'' and the superior commercial quality of the fruit, in the case of the lemons stored under uniform conditions of high relative humidity, tend to emphasize the importance of the factor of relative humidity to the storage and ripening of fruits.

Further observations, similar in character to the ones discussed in this paper, will be made during the summer of 1917 and continued until some further light is thrown on the relation of different conditions of relative humidity to the ripening and holding characteristics of fruits held in storage.

WHAT COOPERATION HAS MEANT TO THE PEACH GROWERS.

By J. F. NISWANDER, Vice President and Manager of California Peach Growers, Inc., Fresno, California.

For two years previous to the organization of the California Peach Growers Company, peach growers had been forced to sell their peaches at prices ranging from two and one-quarter to three and one-half cents a pound, although the average cost of production of dried peaches was nearer four cents a pound. This condition was indeed discouraging, and many growers, rather than harvest them, allowed the peaches to fall from the trees and rot on the ground. It was during these years that much national publicity was given to the distress of cotton growers in the southern states, who, it was claimed, were not making a living at the then prevailing prices for cotton. The humble peach grower, during the same period, was making less on his investment than the cotton grower would have made if the price of cotton had been 25 per cent lower than it actually was. In short, the peach growers were driven to action. The time had come when they must unite into one body with a single purpose—that of bettering the market for dried peaches.

Aggressive growers, therefore, in the Fresno district launched an organization campaign which was to be state-wide in its scope. They realized at the outset that such a campaign would require untiring effort and tremendous sacrifice on the part of the workers. In order to secure the confidence and support of the banking interests of the state it was decided that the association should take the form of a stock company. Accordingly, solicitors were set to work in all of the peach-growing sections of the state. They carried crop contracts and stock subscription blanks for growers' signatures, but they had much to contend with. Numberless attempts had previously been made to form cooperative marketing organizations, but most of them had resulted in failure. One or two had accomplished the desired end and their successes were cited as examples of what the company would mean to the peach growers. However, the effect of one failure on the minds of the growers offset a half dozen successes, and they were timid about joining and subscribing to support a new, untried enterprise. Furthermore, competitive packing interests were active among the growers, offering them much advice as to the probable failure of the company and incidentally agreeing to pay six cents for their peaches, while the growers company only guaranteed five cents a pound. This was hard competition. Most of the growers, however, felt the real need for a cooperative association, since it had been burned into their minds by two disappointing, profitless years. They signed the crop contract, but many hesitated to subscribe for stock and had to be urged and entreated before they would undertake this obligation. At last, when May 1st came, the date on which organization was to be completed, more than $700,000.00 had been subscribed and 80 per cent of the freestone acreage of the state had been signed up for a five-year contract.

The problem of housing the new crop had to be attacked at once. The manufacturing department was confronted with unusual and unforeseen difficulties. The crop of 1916 ripened and was harvested three weeks earlier than usual and just when the company was pressed for time in which to get its equipment together. Added to this was the unusual high cost of materials and the unprecedented shortage of cars. Notwithstanding these difficulties, the crop was housed without appreciable delay or inconvenience to the grower.

When the selling season began the new company met with resistance on all sides. Jobbers throughout the eastern states had met with unpleasant experiences with dried peaches during recent years, when the market had fallen off and they had been forced to hold stocks in storage for a long time, and many refused to buy. A frequent expression was, "I would not buy peaches at any price." Coupled with this was the destructive work of competitive interests who were spreading information far and wide that the growers' company was doomed to an early death. In spite of this discouraging situation the fall selling season of 1916 was reasonably successful, partly because the company consistently warned the wholesale merchant of each intended advance in price, thus giving him an opportunity to make a profit for himself. The results obtained thus far have been eminently satisfactory and a large proportion of the crop has been sold.

But why shouldn't the crop sell? Sun-dried peaches are today the most economical food the housewife can buy. They are selling in all markets at lower prices than are being asked for other dried fruits. In the evaporated condition they are much less expensive today than the canned article, owing to the high cost of tin plate, and also of sugar, both of which commodities enter materially into the cost of canned fruits. They are also rich in fruit-sugar and mineral matter and tend to balance up a diet of meat, eggs, flour, etc. The acid of the fruit neutralizes the fats of the meat. Innumerable attractive dishes can be concocted containing sun-dried peaches which are economical and palatable.

The growers' company is packing its dried fruit under the Ribbon brands, which have been so standardized that the consumer will know what to expect in goods sold under that brand. Ribbon brands stand for quality.

To illustrate what can be gained by cooperation, the average subscription for stock in this company is $121.00; the average delivery per grower is six tons. It therefore follows that an increase of one cent per pound would almost exactly return to the grower in one year the amount of his entire stock subscription. As a matter of fact, the peach growers this year will receive approximately five and one-half cents as against two and three-quarters cents per pound last year.

The example set by the peach growers in California can be followed by growers of other commodities with equal success, providing they base their organization on fundamental principles. Such a company must be properly financed, must have control of the production, and must make the grower a cash payment on delivery. California particularly needs cooperative organizations, because it is so far from the markets where its products are sold. Conditions in this state now point to the fact that growers will continue to cooperate and California will presently attain to a condition for which it has already a reputation, namely, of being "the best organized state in the Union."

THE RELATION OF FARM WEEDS TO HAY FEVER.

By Harvey Monroe Hall.

That plants have for a long time been considered as in some manner connected with the cause of hay fever is indicated by the name of this malady. It was not until recent years, however, that the exact relation of plant pollen to the disease was scientifically established. Today it is well known that pollen produced by the flowers of certain plants is directly responsible for most cases of hay fever. Since something over one million sufferers in the United States are personally interested in the suppression of the plants which cause their trouble, and since at least a portion of these plants are also objectionable as agricultural weeds, it may be worth while for those interested in weed legislation to keep in touch with the work of physicians and others aiming at the prevention of hay fever.

There has been much misconception in the public mind as to the kinds of plants that cause the disease. Many sufferers, and even physicians, have supposed that it was caused by plants with conspicuous and showy flowers. This, however, is seldom the case. The reason is obvious. The pollen produced by large or showy blossoms is almost always insect carried, is therefore relatively heavy and not produced in great abundance. On the other hand, most plants with small, inconspicuous flowers, are wind pollinated, their pollen is therefore light and produced in great abundance, and it is this voluminous, light-weight pollen that reaches the nostrils of susceptible people and causes the trouble. The patient, noticing the showy flowers of a neighbor's orchard trees or ornamental shrubbery, is likely to hold these responsible for his hay fever, whereas the cause is much more likely to be the homely, neglected weeds of the roadside or of his own back yard, the blooming period of these overlooked weeds being the same as that of the flowers to which he has assigned the blame.

It is thus seen that in any attempt to determine which plants are the cause of hay fever in a particular district, the wind pollinated ones should be examined first. But not all such are causative factors and, on the other hand, it is possible that a few insect pollinated species may sometimes produce the disease, at least when large quantities of the flowers are brought near to a susceptible person. Often the botanical relationship of a plant will furnish a clue as to whether or not a suspected species is injurious. Thus, when it was found by experiment that ragweed was actually a source of hay fever, other members of the ragweed tribe of composites, such as poverty weed, cocklebur, Franseria, etc., were examined, and all thus far tested have given positive results.

The final criterion in all cases is what is known as the "biological test." This consists of applying a small amount of the pollen to the nostril of a person susceptible to hay fever, or to the angle of the eye. If the well known hay fever symptoms develop, the plant from which the pollen was taken is then classed as a hay fever species. Skin reactions are also induced with solutions of the pollens, and in this manner the exact species which has caused hay fever in a patient may sometimes be determined by the clever physician. Even a resistance to the disease is sometimes built up by injecting from time to time small amounts of a vaccine prepared from the same kind of pollen as that to which the patient is susceptible. This treatment by immunization is still in the experimental stage and much investigation of hay fever plants and of methods of treatment will be necessary before it can be universally employed.

The study of the causes of hay fever in this country has been carried on largely by the American Hay-Fever-Prevention Association. The work has consisted of a determination of the weeds that cause the disease, the education of the public to the injurious effects of these plants, and an attempt at their suppression through cooperation and legislation. It has been shown that in some districts, notably in New Orleans, the number of hay fever cases has been greatly reduced through the weed-cutting campaigns fostered by this organization and supported in some cases by local ordinances.

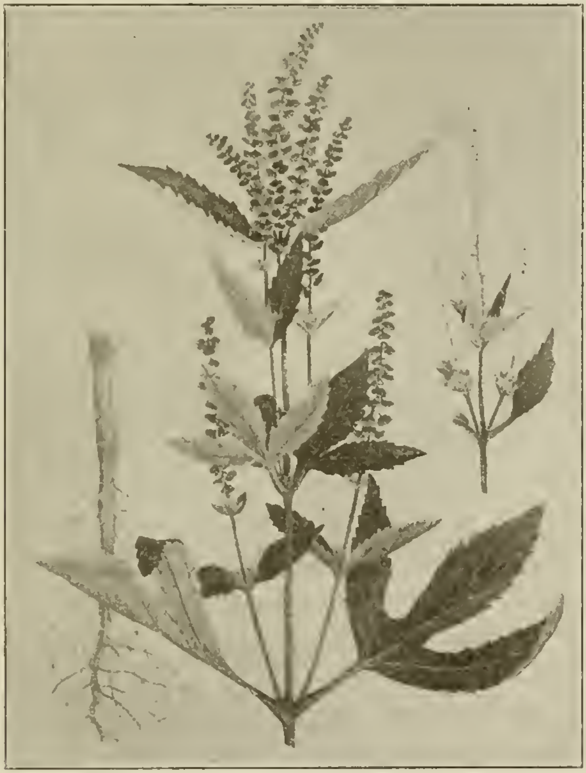

FIG. 8. Greater Ragweed. *Ambrosia trifida,* a southern species which is a chief cause of hay fever. Another species of this plant, *Ambrosia psilostachya,* is found in California. (After Clark and Fletcher.)

In California the study has only begun. Through cooperation with the botanical department of the State University and with local botanists and physicians the association just mentioned has been assembling data and making tests of all plant species under suspicion, so far as pollen could be obtained. Dr. Grant Selfridge, a San Francisco specialist, has inaugurated a botanical survey of certain districts in order to determine the occurrence and abundance of hay fever plants, as well as to procure pollen for testing and for use in treatments for immunization. He considers this well worth while even for use in his own practice. It is highly desirable, however, that the work should be carried on under state or national auspices in order that every district may be thoroughly examined and the results made immediately available.

The results thus far obtained indicate that certain of our weeds are serious offenders. It has not yet been possible to examine certain others which are under grave suspicion. It may be said, in general, that most grasses may cause the spring type of hay fever. Johnson grass, ray grass, and a mixture of timothy and red-top all give positive reactions on test. The disturbance caused by grass pollen is usually not so serious as that brought on by pollen of some other plants, more especially certain ones belonging to the composite family.

Of plants other than grasses, the species thus far investigated include the following:*

Western Mugwort (*Artemisia heterophylla*). This weed, so common on ditch and river banks in many parts of the state, is perhaps our worst hay fever plant. Every effort should be made to eradicate it, or at least to hold it in check by mowing, or otherwise, wherever it grows in abundance.

Western Ragweed (*Ambrosia psilostachya*). In the eastern states the ragweed is the most common cause of the disease. Our western species has a larger pollen but its reaction is just as great.

Cocklebur (*Xanthium pennsylvanicum*) gives a positive reaction and is probably important because of its abundance. However, the relatively large size of its pollen grains prevents it from being a more common cause of hay fever.

False Ragweed (*Franseria acanthicarpa*) and its close relative, *Franseria tenuifolia*, both give a positive reaction.

Curly Dock (*Rumex crispus*) gives a positive but mild reaction. All of the species of dock will probably be found to cause mild cases of hay fever in some districts.

Lamb's quarters, White Goosefoot, or Pigweed (*Chenopodium album*) and Wormseed (*Chenopodium anthelminticum*) both give mild reactions. They are probably of little importance.

Salt-bush (*Atriplex*). One species (*Atriplex bracteosa*) gave a very definite reaction in the case of one patient. Since salt-bushes are so abundant in California and produce pollen copiously during the dry season, they will be further investigated with much interest.

California plants which are under suspicion because of their botanical relationships and which will doubtless be found to cause hay fever include the following:

Sand-bur (*Franseria dumosa*).
Poverty Weed, or Western Elder (*Iva axillaris*).
Bud-brush (*Artemisia spinescens*).
Russian Thistle (*Salsola kali*).
Hymenoclea (*Hymenoclea salsola*).
Guatemote, or Mule Fat (*Baccharis viminea*).
Spiny clotbur (*Xanthium spinosum*).

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*For the results of biologic tests here mentioned the author is indebted in some cases to Dr. W. Scheppegrell, President of the American Hay-Fever-Prevention Association, in others to Dr. Grant Selfridge, of San Francisco.

Sneezeweed (*Helenium puberulum*).
Iodine Bush, or Kern Greasewood (*Spirostachys occidentalis*).
Hop Sage (*Grayia spinosa*).

In addition to these few species there are perhaps a hundred others which need investigation. Among them are many of the showy insect pollinated sorts which may be more important than we think or which may cause hay fever by direct inhalation or under special circumstances. The results will be reported in the medical journals and elsewhere, but in the meantime those especially interested in the subject should consult the reports of Dr. W. Scheppegrell, president of the American Hay-Fever-Prevention Association. The most available of these is Reprint No. 349 from the Public Health Reports of the United States Public Health Service. This deals with the subject in a general way, but I understand that the author is soon to issue a report dealing more specifically with hay fever plants of the Pacific states.

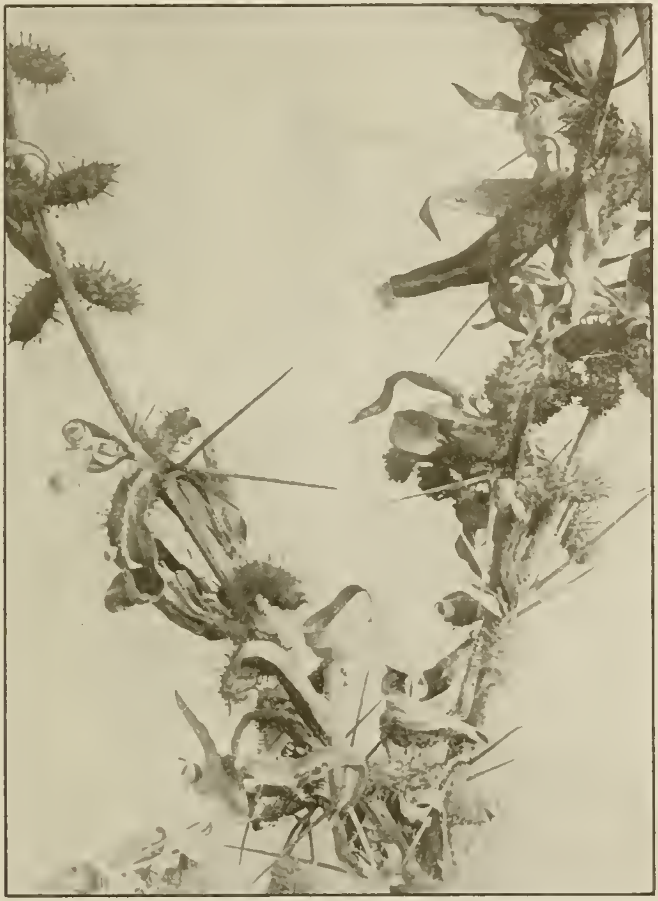

FIG. 9. Spiny clotbur, *Xanthium spinosum*, a very prolific weed in certain sections of California. Known also as Spanish needles. (Newman Mo. Bul., Cal. Com. Hort.)

CANADA THISTLE.

(Cirsium arvensis.)

By O. W. Newman.

The Canada thistle is just becoming established in California, and the time to eradicate it is now, before it becomes a well established resident with us. Infestations have been reported from Humboldt, Lake and Orange counties; these counties are located respectively in the northern, north central, and southern parts of the state, providing three excellent centers from which to distribute the pest. The state commission of horticulture has been directing attention to one of these areas of infestation for the last two years; the other two have only recently been reported. In view of the present widespread interest in weed control we seize the opportunity to inform the public of this most noxious pest, that its spread may be checked.

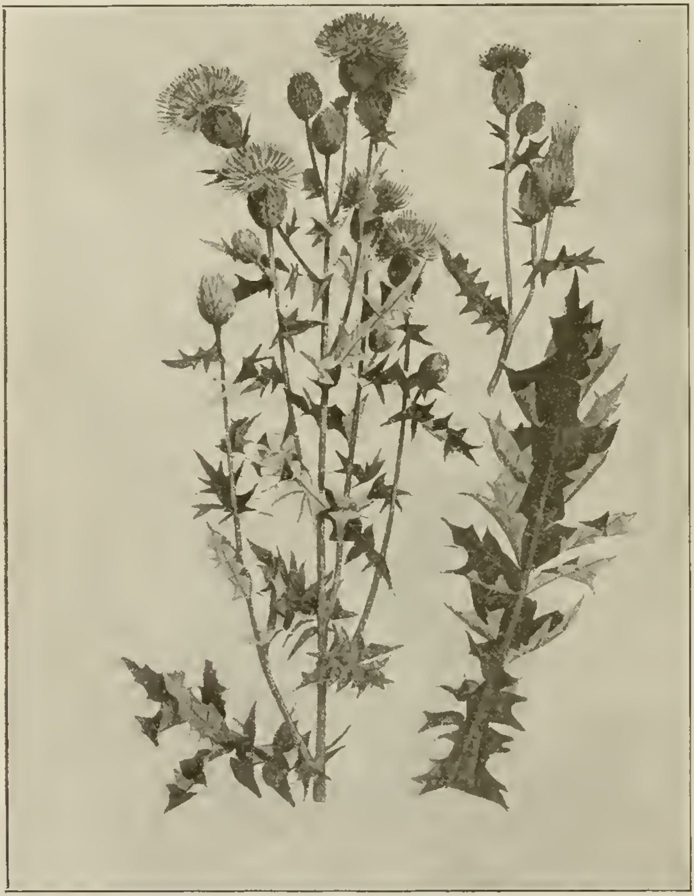

FIG. 10. Canada Thistle, *Cirsium arvensis*, showing the leaves and flowers. (After Clark and Fletcher.)

Canada thistle is found in many parts of the East and Middle West, in Canada, Europe, Australia and the Orient. Nearly every state in the United States has passed laws for the purpose of keeping it out. Nearly every European country has wrestled with it, and the Canadian government has carried on a very persistent fight against it. Without doubt it is one of the worst weed pests known to agriculture. It does not even have the redeeming feature that it can be eaten by stock, as its leaves are so sharp and thorny that few animals will touch it. It is a perennial plant, growing from long, deep-rooted underground stems or root stocks. It spreads from these root stocks very much as does Bermuda grass or Johnson grass, each cut joint being able to produce a new set of plants.

Description.

Canada thistle (*Cirsium arvensis*) is one of the true thistles as distinguished from many so-called thistles like Russian thistle and others. It can easily be recognized by its sharp, spiny, vivid green leaves and bright purple flowers and its long underground roots. In the spring a dense cluster of long irregular leaves first appears close to the ground; the margin of each leaf is lined with sharp spines. Later the flower stalks appear. These are at first somewhat weak and spindly but later strengthen. The branches blossom profusely, resulting in a very attractive plant. The plants are partially diœcious, usually having male flowers on one plant and the female on another. The male flowers are much more globular than the female, and of a deeper color. They are nearly always purple, though occasionally white flowers will be found. The seed is comparatively smooth, of a light brown color, generally slightly curved. The apex is cup-shaped, with a pointed tubercle in the center. The body of the seed tapers slightly to the base, which is rounded. Due to its diœcious habit a considerable portion of the seed is sterile. The root of Canadian thistle is what makes it such a serious pest. It grows rapidly and extends into the soil, sometimes to a depth of two and three feet. When cut it is capable of reproducing new plants without any apparent check to the growth.

Methods of Dissemination.

Like all thistles the seeds of Canada thistle are spread by winds, birds, threshing machines, sheep and hay, in agricultural seeds and in manure. To eliminate distribution by means of seed the most important thing is to prevent seed development.

The underground roots provide another means of dissemination. Any cut portions of these will produce new plants. Careless plowing, threshing machines, harrows and plows passing from field to field often spread the roots over a wider territory. In this way many infestations of Canada thistle, as well as morning glory, Johnson grass, star thistle, and quack grass have been spread from farm to farm. It is unwise to allow any farm machines, especially hay balers, threshing machines and the like, to come onto the farm without being cleaned. Greater care in farming will mean fewer weeds.

Eradication.

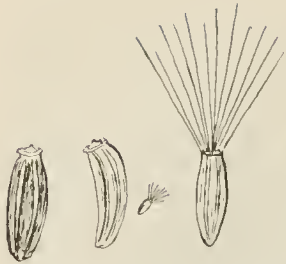

FIG. 11. Seeds of Canada Thistle, *Cirsium arvensis.* The seeds are light brown, slightly curved and flattened, ⅛-inch long, apex cup-shaped with tubercle in center, tapering slightly to rounded base. (Original.)

Ideas differ materially regarding the possibility of eradicating such pests as Canada thistle, but there is no doubt that if the proper methods are used it can be done. Many other states have wrestled with the Canada thistle problem with success where the cooperation of the farmers was secured. Since it occurs in only a few places in California there is little doubt that it can be successfully combatted. The following recommendations are selected from the experiences of other states, altered to apply to our local needs.

1. Plow shallow and harrow as soon as possible after harvesting whatever field crop is grown. The exact location of the infested spots should have been previously marked so that the spot can be harrowed with a springtooth or a light cultivator during the summer and fall. After the first fall rains plow deep and turn all roots to the air, removing as many as possible. Allow the land to lie thus through the winter. In the following spring, plowing and harrowing before the grain is put in, will finish the job.

It must be understood that the idea of such frequent plowings is to keep all green leaves out of sight. The roots will continue to send up shoots until their stock of food is exhausted, when they will die. It is the green leaves which give them new life.

2. If the infestation is very bad hoe-crops should be planted in the spring instead of grain. The careful cultivation required to bring these to maturity will eliminate what thistles still retain life after the treatment outlined above.

3. A good stand of alfalfa planted in a thoroughly prepared seed bed will kill out Canada thistle in the second year. The land should, however, be thoroughly worked over and any thistles which appear should be cut below the surface of the ground. Thistles growing along the fences and roadsides should not be allowed to remain, because the plants spread from the underground roots.

4. Chemical weed killers such as salt solution, arsenite of soda (3 pounds to 100 gallons water), iron sulphate (100 pounds to 100 gallons water), and crude oil can be used to eradicate small patches of Canada thistle. These liquids should be applied directly to the plant roots after the tops have been removed. The action of chemicals under California conditions is still in doubt and the use of them is, therefore, not recommended except as an experiment. Upon application to this office we will gladly supply what information we have in regard to their use.

The following extract on the eradication of Canada thistles on grazing lands is taken from the New Zealand Department of Agriculture "Leaflets for Farmers."

"Any measures preventing the plant from developing leaves will be effective. The following have been thoroughly tried: cut the thistles down close to the ground—if a large patch, use a scythe—then dose the ground well with a solution of arsenic, carbolic acid or other poison. The wash from sheep dips will do, or even a liberal dressing of common salt. Repeat the treatment if possible as soon as the plants show above ground; never allow them to develop leaves. Remember that the leaves are the lungs of the plant, and without them it must die. Even old established plants will, by this treatment, be eradicated in two years, and proper vigilance will prevent the pest ever again obtaining a foothold.

"The expense and trouble will be more than repaid by the result, *i. e.*, extermination, and that will be more cheaply and more easily effected now than some years hence. The Canada thistle never dies out. Slowly but surely its roots penetrate in all directions, and if the farmer does not eradicate the thistle, the thistle will eradicate the farmer."

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical and other publications of a similar nature.

G. H. HECKE, State Commissioner of Horticulture—Censor
GEO. P. WELDON, Chief Deputy Commissioner—Editor

ASSOCIATE EDITORS.

H. S. MADDOX—Secretary State Commission of Horticulture
HARRY S. SMITH—Superintendent State Insectary
FREDERICK MASKEW—Chief Deputy Quarantine Officer
O. W. NEWMAN—Assistant Secretary State Commission of Horticulture

Entered as second class matter December 29, 1911, at the post office at Sacramento, California, under the act of June 6, 1900.

To the Readers of the Monthly Bulletin.—As stated before in these columns, the writer has accepted a position as foreign collector of beneficial insects for the insectary division of this commission. The opportunity for results along this line is believed to be most excellent, and this new work is entered into with a feeling that a great service can be rendered the fruit growers of the State of California in the collection of beneficial insects which will lessen the toll they are called upon to pay each year in controlling insect pests.

The many kind words which have been received relative to the Monthly Bulletin have been appreciated, and the new editor will without doubt have the same courtesies extended to him.—E. J. VOSLER.

Proposed Legislation.—The proposed amendments to the horticultural code of the state, the result of the careful work of the Horticultural Legislative Committee, have been entrusted to Senator Benson of Santa Clara County, who introduced them in the Senate on January 24th.

I will take this opportunity of expressing my great appreciation, which I am sure is shared by each of the county horticultural commissioners, of the unselfish gift of time by Mr. F. B. McKevitt, chairman of the Legislative Committee, and his associates. It is not time alone that they have given, they have also borne the burden of paying their own traveling expenses (some have come from the South to these meetings), which in the course of the last six months have amounted to a considerable sum.

The State Horticultural Commissioner's Act has been amended as follows:

I. Two field deputies are provided for the purpose of aiding the county horticultural commissioners in the enforcement of horticultural legislation, to bring about greater uniformity in the work of the county horticultural commissioners, and to render assistance in the enforcement of standardization rules and quarantine regulations.

II. Nurserymen will be required to secure permits from the State Commissioner of Horticulture entitling them to sell nursery stock within the state. The State Commissioner shall issue to each nurseryman a license bearing a special number which must accompany every shipment and delivery of nursery stock.

III. Nurserymen outside the state will be required to secure a permit from the State Horticultural Commissioner to sell nursery stock within the State of California. Permits granted to outside nurserymen shall be numbered and all shipments sold or delivered in California must bear such a number.

The contemplated amendments to the County Horticultural Commissioners Act change four of the sections of the present act and add four entirely new sections. The changes may be briefly enumerated and commented upon as follows:

1. Ground squirrels and gophers are added to the list of pests that the county horticultural commissioner is ordered to eradicate or control.
2. If, for any reason, a board of supervisors refuses or neglects to appoint a county horticultural commissioner as required by law, the State Board of Horticultural Examiners shall appoint from the list of qualified persons.
3. In case the county horticultural commissioner exercises his authority to compel eradication or control of plant diseases, insect, animal or weed pests, a lien is filed upon the property sufficient to cover the cost of such eradication or control. Said lien shall take precedence over and be paramount to all other liens upon the land excepting only the lien of taxes.
4. Provision is made for traveling expenses of county horticultural inspectors when within their respective counties. County horticultural commissioners shall be paid traveling expenses when working outside the counties, when such service has been authorized by the supervisors.
5. County horticultural commissioners may be paid either one thousand eight hundred dollars per annum, or six dollars per day at the option of the county boards of supervisors.
6. Statutory provision is made for holding imported plants at destination until they have been inspected.
7. Uniform treatment and disposal of infected shipments is provided.
8. County horticultural commissioners are given power to grant permits upon examination, to public sprayers and fumigators.
9. The words "or control" are added wherever "eradicate" is mentioned, thereby making it possible to force control measures when eradication is impossible.

These proposed amendments to the County Commissioners Act may not make it absolutely perfect, but I feel that it will be far better and stronger than ever before, and should it be found desirable to have some slight amendments added, to strengthen the weak points, it can be done in the agricultural committee of the legislature. As a whole the County Commissioners Act represents the results of the joint labor of fruit growers, nurserymen and commissioners from the north and from the south, and as such it will command the careful attention of our representatives in the legislature.

In addition to the proposed amendments to the State and County Commissioners Act, two new acts are introduced, providing ways and means to send out two collectors of parasitic insects, one to collect parasites for the control of the beet leaf hopper, the carrier of the destructive leaf-curl disease in California, and the other to collect parasites to control the constantly increasing mealy bug pest in citrus groves.

The results so far obtained from the work of *Leptomastix*, and the fact that it has successfully hibernated in Marysville, warrant in my opinion the expense of further search in countries likely to have the parasites.

Senator Benson has also introduced an act making it a misdemeanor to import live insects into California. This is necessary to prevent repetition of the action of insect collectors like the one in Los Angeles who recently imported from Florida a shipment of living larvæ known as orange dog caterpillars, an exceedingly destructive citrus pest which does not exist in California. Fortunately, this shipment was intercepted and destroyed by the deputy quarantine officer in Los Angeles.

I may mention here as an interesting fact that the destructive Gypsy moth was introduced in Massachusetts by a collector whose carelessness has cost the affected states and the United States Government millions of dollars in an effort to control the pest.

The intervening thirty days between the first and second sessions will give all those interested in horticultural legislation an opportunity to study the proposed amendments, and if improvement is desirable in some cases, this office should be notified as soon as possible.—G. H. H.

Storage of Fruits.—We wish to call the special attention of our readers to the article in this number of the Bulletin by Mr. A. D. Shamel of the United States Department of Agriculture. If we may judge from the one carefully planned and executed experiment recorded in this article, the factor of relative humidity is of as much if not greater importance in the storage of fruits than temperature, and the data submitted to the public through this article we believe is far reaching in its importance. This preliminary experiment will serve as a basis for future tests in the storing of fruits under differing conditions of temperature and relative humidity, and indications are that these factors may be regulated in such a way as to preserve fruit for long periods of time without the necessity of icing. A study of the table in this article brings out the remarkable fact that with temperatures ranging from 79 to 100 degrees Fahrenheit and the relative humidity from 68 to 96 per cent, Bartlett pears placed in the storage room when hard but ripe, remained there for thirty days without further ripening or deterioration.—G. P. W.

Plant Lice.—While most insects which feed upon plants are restricted in their food habits to a certain species, the plant lice or *Aphididæ* present some striking exceptions to this rule, and often a species of aphis may be found upon two or more widely separated species of plants. The articles in this issue, by Prof. C. P. Gillette of the Colorado Agricultural College and Mr. W. M. Davidson of the United States Bureau of Entomology, mention certain species of aphids which have alternate host plants. The mealy plum louse, *Hyalopterus arundinis*, a very destructive enemy of plums and apricots, has been found by Mr. Davidson on cat-tails during the summer season. This species also has the habit of migrating from plums and apricots to a species of reed grass, *Phragmites communis.* This knowledge is of practical importance in that it might be possible to reduce the numbers of this pest in an orchard by the destruction of the alternate host plants which may occur near by. Indications, however, point to the fact that the frail-bodied plant lice may travel miles from orchards to these other food plants, thus the destruction of host plants near by might not result in complete control.

The article by Professor Gillette was read at the Stanford convention in July, 1915, and has never been published. Coming from one of the greatest authorities on plant lice in America, its value to the readers of the Monthly Bulletin is unquestioned.—G. P. W.

The Entomological Explorer.—It is unfortunate, but it is a fact, that many good people look upon these missions to foreign lands in quest of beneficial insects as sinecures, or, as some of the more outspoken say, "joy rides." The recipient of a commission as parasite collector is heartily congratulated on his good fortune and is greatly envied his opportunity for a fine trip at someone's else expense—by those who do not know. But parasite collecting is far from being a pleasure trip. The responsibility that a collector has to carry is no small item, and the many disappointments alone that are bound to come to him in the course of his work, through no fault of his, are sufficient to destroy what little pleasure he might otherwise find in his travels. It is no easy matter to transport living parasitic insects from such far away countries as India or Australia to California, and one can easily imagine the feeling of discouragement a collector experiences when he learns that a shipment of parasites which he has spent weeks of hardship to accumulate arrived at its destination in a dead or dying condition. The constant fight with excessive moisture causing mold, or excessive dryness, which is quite as bad, with the difficulties in the way of shipping potted plants long distances, with the refusal of some insects to breed in confinement, with the danger of secondary parasites, with suspicious transportation officials and with steamship delays, are things which are unknown to the critics of this work, but which are very real to the parasite collector. Parasites have no regard for the eight-hour day, for Sundays and holidays or for rainy weather, and Koebele well expressed this when he said, "It was in the early morning, with nothing but a cup of black coffee for breakfast, that I regularly had to leave the hotel for the fields, regardless of the day or of atmospheric conditions. Dinner had to be taken at night—too late for meals at the hotel where I had paid for same and, tired and worn out, I had yet to hunt up some restaurant for a late supper." And even Koebele had his critics.

And these are not all the difficulties with which he has to contend. Traveling in semicivilized regions, eating and sleeping in places which are almost unbearable and where safe drinking water is unknown, he is continually risking his health and even his life through contracting typhoid, dysentery and other unpleasant things. One of our collectors recently had to have a military guard to protect him from the headhunters of Formosa! And what is the financial reward for braving all these dangers and disappointments, and for spending years in highly specialized study for preparation? Usually about what is paid to a first-class shoe clerk in a California shoe store. Parasite collecting requires persistence, ability, resourcefulness and adaptability of no mean sort. This is well illustrated by the fact that it required four trips to the South Sea Islands before Muir succeeded in getting the natural enemies of the sugar-cane borer successfully established in Hawaii, and during these trips several months were spent in the hospitals on account of sickness incurred in the work.

The hardships are sufficient to turn aside all but the most determined, and it might be said truly that good parasite collectors, like poets, are born, not made.—H. S. S.

The White Pine Blister Rust.—Quarantine Order No. 30, relating to White Pine Blister Rust, a disease affecting all five-leafed pines, has just received the signature of the Governor. This order was necessary for the following reasons:

First—The sugar pine lumbering industry of California is of tremendous importance, and there would be a serious crippling of this industry should the disease be introduced within the borders of the state.

Second—Currants and gooseberries are alternate hosts of this disease; these have been imported into this state from the East in considerable numbers in the past. With the possibility of the disease being introduced by these hosts, they constitute a menace and should be excluded.

Third—This office has been advised by the Forest Pathology Department of the United States Department of Agriculture that such a quarantine should be passed.

Fourth—A representative of the Federal Horticultural Board, who visited this office some months ago, urged the passage by the State of California of such a quarantine order.

During last April the quarantine guardians of the state were notified by letter from this office to watch for all shipments of currants and gooseberries from states east of the Mississippi River, and to refuse admission under that provision of our state quarantine order, section 3, to wit:

> "Reasonable cause to presume that they may be so infested or infected."

Therefore, we have been protected to a certain extent since the above letter was mailed, but the situation demands more drastic action and we believe the new order gives us the best possible protection.

CALIFORNIA STATE COMMISSION OF HORTICULTURE QUARANTINE ORDER No. 30.

WHITE PINE BLISTER RUST.

The fact has been determined by the State Commissioner of Horticulture that a contagious tree disease, known as White Pine Blister Rust (*Peridermium strobi*, Kleb.), new to and not heretofore distributed within and throughout the State of California exists in several states of the United States, and that the species and varieties of currants and gooseberries (*Ribes*) are known to be carriers of this disease.

Now, therefore, it is declared necessary, in order to prevent the introduction of White Pine Blister Rust into the pine forests of the State of California, that a horticultural quarantine be and the same is hereby established at the boundaries of the State of California, in accordance with the provisions of section 2319*b* of the Political Code of the State of California, against all five-leafed pine trees, and all species and varieties of currant and gooseberry plants and cuttings, imported or brought from any and all states and districts of the United States east of the Mississippi river,, and no such five-leafed pine trees, or currant or gooseberry plants or cuttings shall be permitted to pass over the said quarantine lines so hereby established and proclaimed.

Hereafter, and until further notice, all five-leafed pine trees, and currant and gooseberry plants and cuttings, from any and all states and districts of the United States east of the Mississippi River are denied admittance into the State of California, and upon the arrival of any such trees, plants or cuttings as quarantined against in this order, the same shall be immediately sent out of the state, or destroyed at the option and expense of the owner or owners, his or their responsible agents. All deputies of the State Commissioner of Horticulture, and State Quarantine Guardians are hereby empowered to carry out the provisions of this order.

G. H. HECKE,
State Commissioner of Horticulture.

Approved:
Hiram W. Johnson,
Governor of the State of California.

COUNTY COMMISSIONERS DEPARTMENT.

SHORTAGE OF CYANIDE FOR FUMIGATING CITRUS TREES.

By B. R. JONES, Deputy County Horticultural Commissioner, Los Angeles, California.

It is deplorable that all the sodium cyanide obtainable for fumigation of citrus trees must be procured from one concern. This fact has been brought very forcibly to the minds of citrus growers this fall by the failure of the cyanide supply and the excuses which have been put forward to account for it. It is, therefore, to be very fervently hoped that other firms may engage in the manufacturing of this material, which must be quite profitable, and still better, that a factory might be established near the Pacific coast where practically all the cyanide in America is used, either for mining or fumigating purposes. However, for these desirable things, we must trust the future. At present we are short of cyanide, and our trees need fumigation very much. What shall we do? Spraying seems to be the only recourse, and its effectiveness depends very largely on how the work is done, although good authorities go so far as to say that no fair sized citrus tree thickly covered with its foliage, as it must be if thrifty, was ever wet in every part in the process of spraying, and of course the scale insect pests on any portion of a tree not touched by the spray are unaffected.

Prunes in San Joaquin County.

Word comes from H. H. Ladd, horticultural commissioner of San Joaquin County, that there are more prunes being planted in his county this season than any other orchard trees. San Joaquin County is said by Mr. Ladd to possess some very fine prune lands which are attracting the attention of people from other sections. The absence thus far of pear thrips is in favor of this section. The varieties being planted are French, Sugar, Imperial and Robe de Sergent.

Crop Report and Acreage Statistics.

A determined effort is being made in certain counties to obtain figures on acreage and production that are reliable. In this connection the most excellent reports from Riverside, San Bernardino and Kings counties should be mentioned. In the latter named county, Horticultural Commissioner Howard is so sure of his figures that he is giving them publicity by distribution in printed form on a small card the size of a postcard. Gradually the difficulties attendant upon getting accurate crop statistics are being eliminated and it is hoped that the reports from every county in the state may soon be as complete as those from the counties mentioned. The demand for these statistics is urgent and a county horticultural commissioner can do a great service for his county and the state by spending considerable time in perfecting a system whereby the attainment of accurate figures on area and production of orchards may be brought about.

HABITS OF SOME COMMON PLANT LICE.

By C. P. Gillette, State Entomologist, Colorado.

The Aphids, commonly spoken of as "plant lice," are among the smallest, weakest and apparently the most stupid of insects, with meager powers of defense, or means of escape from their enemies. Yet, these seemingly most unfit creatures of the insect kingdom are, for some cause, remarkably "fit" from the standpoint of the evolutionist, for they have been able to live and propagate their kind and become extremely abundant, in spite of the many natural enemies that continually prey upon them.

The lady-beetles, in both their larval and adult stages, feed voraciously upon the plant lice, which they devour bodily much as a cat eats a mouse. They are one of the most efficient natural agencies for the control of plant lice. Miss M. A. Palmer, who made a study of the life histories and food habits of several of our most common species of lady-beetles, took the pains to count the aphids she fed to them and announced the approximate number required as a life ration for a beetle during the larval stage as varying from 264 to 621, depending on the species. Adult beetles ate, or partially devoured, as many as 200 in one day.

The Syrphus flies, which, in Colorado at least, are the most efficient natural enemies in the control of plant lice, and the aphis lions, which are very destructive to some species, destroy their victims by merely sucking their blood. Because of this habit of feeding upon the body fluids only, these aphis destroyers require a much larger number of insects for food than would be needed if they devoured their victims bodily.

Many species of aphis are destroyed in countless numbers by minute Hymenopterous parasites that feed within the bodies of their hosts. The *Braconida* are especially destructive in this manner. Certain gall-forming species, such as *Eriosoma americana* of the elm and *E. lanigera* of the apple, are destroyed by Capsid marauders, which should, according to our ideas of propriety, feed only upon the leaves of plants.

Many other enemies of lesser importance might be mentioned, but those already given are sufficient to call attention to the severe struggle for existence that the aphids have to carry on continually. In spite of it all, nature has provided abundant ways by which these apparently helpless creatures may live on from year to year and from generation to generation. They positively thrive amidst the terrible carnage that goes on continually wherever they establish their colonies.

What are some of the reasons that these minute insects are able to maintain their existence against what seem to be tremendous difficulties? First, and most important, is their wonderful power of reproduction. Many of the species exist as viviparous females, no males being known at any stage of their development. Most of the species with which the fruit grower is familiar spend the winter in the egg stage, all the individuals of the year dying off when cold weather comes. These eggs are nearly always deposited about the buds of trees or shrubs, and hatch early in the spring. Hatching usually takes place a little before or about the time the first buds are sufficiently swollen to show the tips of the opening leaves. Some species, notably the green peach aphis, *Myzus persicæ,* hatch so early that the stem-mothers (the lice from the eggs) may be fully grown and be giving birth to living young of the second generation before the buds open enough to show the green of the expanding leaves.

It is common for the viviparous lice to give birth to living young at the rate of five to eight or ten a day, until each becomes the parent of 50 to 100, or even more. It is common for aphids to mature and begin giving birth to living young at the age of from seven to ten days, so that ten or twelve broods a year is not a large number. The descendents of one louse passing through ten generations of 50 each, provided all find a normal food supply and escape the attacks of their natural enemies, would be approximately two quadrillions. If they were all martialed, 150,000 abreast, in close enough order so that each could place its antennæ upon the closed wings of the louse in front, they would make a procession long enough to reach around the world. These figures are entirely beyond our comprehension and are of little use except to aid us in appreciating the wonderful balance that nature has established among her myriads of living creatures with their wide diversity of habits. The balance would not be complete with one of these species left out. In a study of the *Aphididæ* in their relation to other living forms, we surely have, in the words of Pope, "A Mighty Maze, but not without a plan." It is a marvelous natural balance and interrelationship of living things that can hold such a possibility of development so completely in check and yet not exterminate a single form, except at long intervals, and then only by allowing some other to take its place. When the balance is upset for a brief time for some species it is probably due, in most cases, to the meddling hand of man, who, more than storm or tempest or earthquake, has greatly changed the face of nature and used her most powerful and subtle forces to do the bidding of his fitful mind. Now man must use the highest powers of his God-given intellect to ward off or overcome the evil effects that are fast coming to him as the direct result of his interference with nature's plan. It is a good illustration of the Great Law of Compensation of which Emerson wrote.

It is not enough that aphids should have great powers of reproduction, for this alone would not save them from extinction. As soon as a colony becomes established one or more of the enemies mentioned above makes its appearance and begins to devour the lice so rapidly that all would be destroyed were it not for the power of flight which some of the individuals acquire enabling them to go in search of distant food plants where, for a time, they may establish new colonies away from immediate danger. While the power of flight is of great service to the species during the summer, it would not do for the stem-mothers hatching from the eggs to fly away from their natural food plants upon which the eggs were laid the previous fall, as some of them might wander and be lost, so they are always without wings and have to stay at home and attend strictly to the raising of their numerous families.

Another most wonderful habit possessed by many of the plant lice seems to have for its chief purpose the protection of the species from the terrible onslaughts of its enemies. It is that of suddenly changing the host plant of the species. While some species have long been known to have this wonderful instinct, it is only in recent years that students of this group have realized how general this habit is. Perhaps we can not select a better example to illustrate this habit than the green peach aphis, *Myzus persicæ,* already referred to. This louse is generally distributed in regions where the peach or plum is grown and is doubtless familiar to most growers of these fruits. Early in the season the lice attack the leaves, causing them to curl and turn yellow. They also attack the young peaches, causing them to shrivel and drop. A few of the young of the stem-mothers acquire wings and fly away, a large proportion of the third generation do the same thing, and by the middle of June, as a rule, nearly every louse has developed wings, lost its appetite for the peach, and gone in search of some succulent herbaceous plant which can serve it as food until about the first week in September. Over seventy summer food plants of this louse have been recorded about Fort Collins, Colorado, by the writer and his assistants. Prominent among these plants are the cabbage, cauliflower, rape, lettuce, tomato, potato, beet and radish. The return migrants in the fall search out the pit fruits, seeming greatly to prefer the peach, and upon the leaves of these trees they deposit the egg-laying females. When these are about half grown, winged males that develop upon the summer hosts begin to gather upon the peach leaves also. The sexes mate and later the females deposit their greenish-yellow eggs about the buds of the small twigs. These eggs soon turn black in the sunlight. This work of egg laying continues until the full quota has been deposited or until severe freezes at night kill the egg-layers. The egg-laying sexual females of this, and practically all other species of our plant lice, are wingless. Here, as in the case of stem-mothers, it is important that the females stay upon the plant where they are born, that they may not wander to some other host upon which the spring form, hatching from the egg, can not live.

The stem-mothers and the egg-laying females of this species vary from light pink to deep salmon in color, while other apterous lice of the year are pale yellowish or greenish in color. One not knowing the life history of this insect and its variations in form and color would not suspect that these three wingless forms are of the same species.

While this aphid has the alternating food habit, we have often found the summer form living over winter in somewhat protected places upon the green stems and leaves of herbaceous plants. In fact, I might say that it is quite a common thing for these species of plant lice to continue indefinitely upon one of the food plants. This plant is usually the summer host.

The instinct to alternate food plants is doubtless of far greater importance in getting away, or eluding enemies, than the simple habit of flying from one food plant to another of the same kind, where it is likely that a colony of the louse with its natural enemies already exists. It is evidently a matter of importance, however, for some of the fall brood to get back to a woody plant to deposit eggs where the opening buds in the spring will furnish food for the young lice.

Some of the other lice that are troublesome to the fruit grower and that have this particular habit are: The grain aphis, *Aphis avena,* which, in Colorado at least, is the most common green apple louse

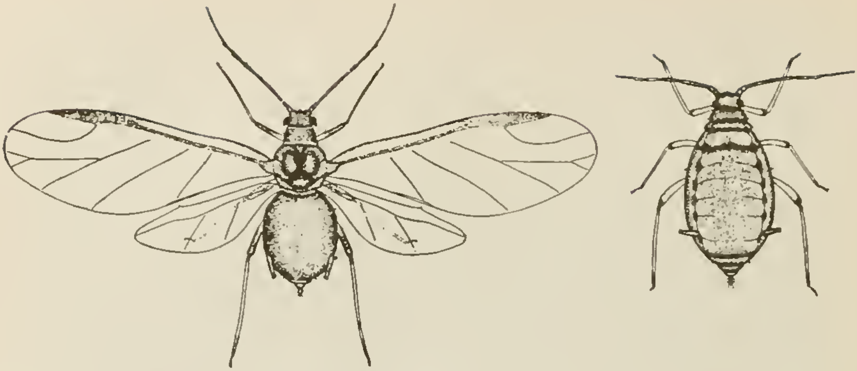

FIG. 12. The Oat Aphis, *Aphis avenæ* which feeds on apples during the early spring, migrating later to oats.

early in the season, and which has the oat plant for its summer host; the rosy aphis, *Aphis sorbi*, which is very destructive to both fruit and foliage and which, according to Professor P. J. Parrott, has the habit of going to the plantain for a summer host;* the clover aphis, *Aphis bakeri*, which hatches on the apple and thorn twigs in the spring and in the second and third generations goes to the clovers, especially the red clovers, where it thrives during the remainder of the year; the powdery plum and prune louse, *Hyalopterus arundinis*, which loads the underside of the leaves of these trees during the early part of the summer and then deserts the trees and goes to coarse grasses, especially

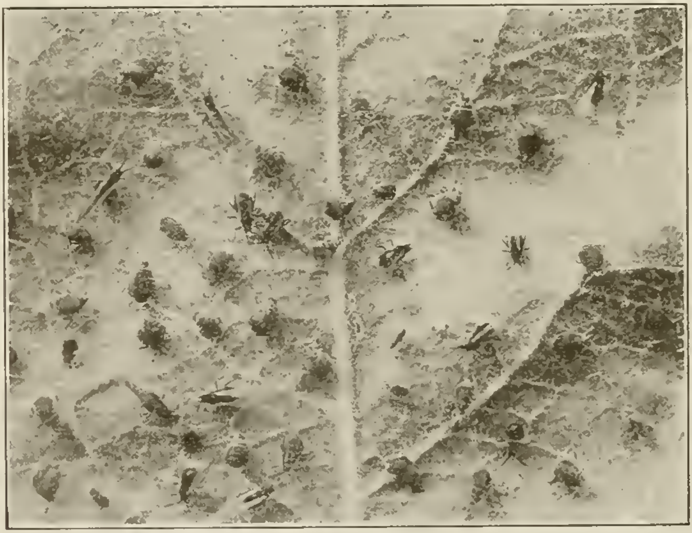

FIG. 13. The rosy apple aphis, *Aphis sorbi*. Winged and apterous females on an apple leaf. This species attacks apples in the spring and migrates later to other host plants. (After Essig. Injurious and Beneficial Insects of Cal.)

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*In Colorado we have successfully transferred this louse from the apple to the plantain upon which it seems perfectly at home.

reed grass, *Phragmites* sp., where it remains until fall and then returns to the trees and deposits its eggs; and the hop aphis, *Phorodon humuli*, which also attacks the foliage of the plum and then deserts the plum for the hop as a summer host. Mr. L. C. Bragg has been able to trace this species throughout the year in small numbers upon plum at Fort Collins. There are several others of more or less importance which might be added.

Some of the species attacking shade trees and ornamental shrubs also have most interesting migratory habits. The louse causing the leaf-cluster gall of the American elm has been repeatedly transferred to the apple by Dr. Patch, Mr. A. S. Maxon, Mr. Baker and, at Fort Collins, by Mr. Bragg. These colonies are indistinguishable from those of the woolly aphis, *Eriosoma lanigera*, produced from over-winter forms on the apple, so that, while the woolly aphis of the apple is able to live on from year to year without receiving migrants from the elm, and seems to thrive quite as well in regions where the elm is not grown, there seems to be a tendency to migrate between these hosts to some extent.

The snowball louse, *Aphis viburnicola*, is very destructive to the foliage of the Viburnum, and often ruins the flowers, but the offspring of the stem-mother, the second generation in the spring, all desert the snowball and go to unknown hosts which we have not been able to locate. In September and October, the fall migrants come back to the snowball and deposit the yellowish white oviparous females upon the leaves, and by the time these egg layers are half grown, the winged males begin to arrive. The sexes mate, and the females, as soon as they are fully grown, desert the leaves for the purpose of depositing their eggs about the buds and rough places on the bark.

The Blue and Engelmann spruces and the Douglas fir should never be placed near each other in parks or upon lawns, as *Chermes cooleyi*, which produces the cone-like galls at the tips of the twigs of the Blue and Engelmann spruces, deserts these trees during July to go to the needles of the red or Douglas fir, while the form *Chermes cooley*, var. *coweni*, which develops upon the leaves of the Douglas fir, returns to the Blue and Englemann spruces during the same month and deposits the eggs which hatch into the over winter stem-mothers. The following spring these stem-mothers produce the brood which locates at the bases of the young growing needles just as the buds are opening and cause the cone-like galls. The Douglas fir or spruce, as it is called, in close proximity to the other spruces mentioned, is a serious menace to them because of the large numbers of this louse that it contributes for the destruction of the terminal growths early in the summer.

Cottonwoods are known to serve as winter hosts for the beet aphis, *Pemphigus betæ*, though a portion of the lice always spend the winter in the ground.

Many of our economic species of the *Aphididæ* lack this alternating food habit completely. The green apple louse, *Aphis pomi*, the black cherry louse, *Myzus cerasi*, the box elder louse, *Chaitophorus negundinis*, and the dandelion louse, *Macrosiphum taraxicis*, are good examples. The successful control of the aphis depends largely upon one's knowing the life habits of the species in question, and the enemies that are associated with it.

THE CAT-TAIL RUSH, *TYPHA LATIFOLIA,* AS A SUMMER HOST OF INJURIOUS INSECTS.*

By W. M. Davidson, U. S. Bureau of Entomology, Sacramento, California.

The cat-tail rush is abundant in California along watercourses, in ponds and marshes, and even in irrigation ditches. Very frequently this water plant thrives in close proximity to orchards, and throughout the long dry summers it remains green while the grasses and weeds in great part begin to die off in the late spring.

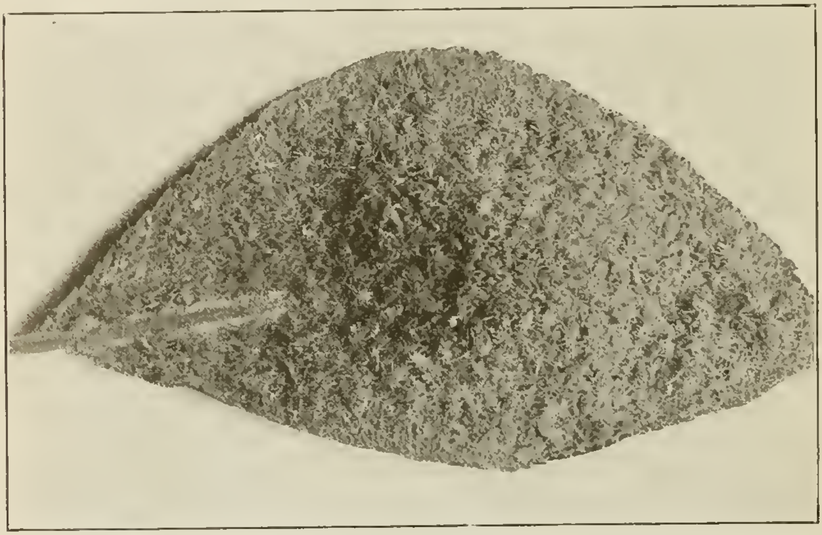

Fig. 14. The mealy bug plant louse, *Hyalopterus arundinis* Fabricius, on the underside of a prune leaf. Enlarged twice. (After Essig, Monthly Bulletin, Cal. Hort. Com.)

Perhaps the chief insect pest that feeds on the rush is the mealy plum aphis, *Hyalopterus arundinis* Fabricius. Spring migrants of this species commence arriving from the winter hosts, plums and apricots, at the end of April and continue to arrive until the end of July. They deposit young on the cat-tail and there ensues a series of wingless generations until the middle of October, at which period the winged fall migrants and the winged males are first produced. The colonies, however, straggle on as late as December, the fall migration extending over a period of one and a half months. The winged forms migrate to the fruit trees, the fall migrants depositing the egg-laying females, which when mature copulate with the migrating males and forthwith deposit winter eggs on the twigs. Considering the very large numbers of spring migrants which find their way to the rushes, the ensuing infestations on this host are remarkably small, and observations have shown that many migrants fail to deposit any young, but nevertheless, after death, are found to contain embryos. Regarding the fall migrants and males it may be said that, provided the foliage of the winter hosts is not prematurely blown off by storms, it does not require a large number of these to insure an appreciable egg infestation.

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*Published by permission of Chief of the Bureau of Entomology.

From four to ten generations appear to occur on the rush, the aphids settling on both sides of the blades, locating in colonies, chiefly not far from the tips.

The reddish-brown plum aphis, *Rhopalosiphum nymphææ* Linn., which occurs on plums of both European and Asiatic origin, uses the cat-tail along with many other water plants, *Alisma, Nymphea, Potamogeton,* etc., as summer hosts. The spring and fall migrations occur at about the same time as for the mealy aphis. The spring migrants are more prolific than those of the latter species and therefore the rush colonies grow faster. They are, however, more readily disposed of by predators and in the majority of cases are soon wiped out, while the smaller colonies of the mealy aphis more frequently escape.

The grain aphis, *Macrosiphum granarium* Kirby, colonizes *Typha* during the summer and fall, winged forms arriving in May and June and another such generation departing in the late autumn. This species is very prolific, but its numbers are heavily depleted through predators. In spring it is common on grasses and it appears in California to pass the winter in the viviparous form on these hosts. Gillette and Bragg, in Journal of Economic Entomology, February, 1915, page 103, state that in Colorado *granarium* deposits winter eggs on rose bushes. This procedure may also occur in California along with the viviparous winter-feeding form.

Aphis avenæ Fabricius, the oat aphis, is another grass species that may be found, often in large colonies, on cat-tail during summer and fall. In winter and spring it is found in California on grains and grasses. It also virulently attacks corn, and both on corn and cat-tail is most commonly found concealed under the outer leaves near the base of the stalk. Normally, *Aphis avena* winters in the egg stage on rosaceous plants, including the apple, but in California viviparous forms occur during the winter on grasses and in early spring these attack grains. During the summer and fall, after the grasses have dried up and the grains have been harvested, corn and cat-tail are the principal hosts. Few winged forms are produced among the cat-tail colonies and with the advent of the winter rains large numbers of the wingless individuals are submerged.

A small, black aphis, probably *Aphis gossypii* Glover, also occurs in small numbers during the summer and fall months, migrating forms appearing at the end of October.

Red spider-mites, *Tetranychus* sp., feed, sometimes in abundance, on *Typha* during the summer months.

In the light of the foregoing it is obvious that the cat-tail rush harbors pests of notable importance, and that it should be looked upon with disfavor by persons engaged in growing crops which may be attacked by insect pests.

QUARANTINE DIVISION.

Report for the Month of December, 1916.

By Frederick Maskew.

SAN FRANCISCO STATION.

Steamship and baggage inspection—

Ships inspected	72
Passengers arriving from fruit fly ports	3,301

Horticultural imports—

	Parcels
Passed as free from pests	195,138
Fumigated	4,698
Refused admittance	78
Contraband destroyed	30
Total parcels horticultural imports for the month	199,944

Pests Intercepted.

From Brazil—

Lepidopterous larvæ in axils of orchids.

From China—

Melanose on pomelos.
Fungus on oranges.
Cylas formicarius in sweet potatoes.
Larvæ of weevils in beans.

From Hawaii—

Pseudococcus bromeliæ and *Diaspis bromeliæ* on pineapples.
Coccus longulus on betel leaves.
Chrysomphalus aonidum on cocoanuts.

From Holland—

Lepidosaphes ulmi on boxwood.
Aspidiotus brittanicus, *Aspidiotus hederæ* and *Coccus hesperidum* on bay trees.

From Japan—

Lepidopterous larvæ in chili peppers.
Pseudaonidia duplex on camellias.
Thyridopterix sp. on daphne.

From Mexico—

Trypeta ludens in guavas.

From Papeete—

Coleopterous larvæ in sugar-cane.
Lepidosaphes beckii on oranges and limes.
Fungus on oranges.

LOS ANGELES STATION.

Steamship and baggage inspection—

Ships inspected	37

Horticultural imports—

	Parcels
Passed as free from pests	94,176
Fumigated	481
Refused admittance	24½
Contraband destroyed	5⅓
Total parcels horticultural imports for the month	94,687

Pests Intercepted.

From Belgium—

Aleyrodes sp. on azaleas.
Aspidiotus brittanicus and *Coccus hesperidum* on bay trees.

From Florida—

Lepidosaphes beckii on grapefruit.

From France—

Unidentified weevils in tree seeds.

From Holland—

Lepidosaphes ulmi on boxwoods.
Coccus hesperidum on holly.

From Hawaii—

Chrysomphalus aonidum and *Parlatoria* sp. on cocoanuts.

From Mexico—

Howardia biclavis on unidentified plants.

From North Carolina—

Aulacaspis pentagona on loquat.
Aleyrodes sp. on Cape jessamine.

From New York—

Diaspis boisduvalii, Coccus hesperidum and *Saissetia hemisphærica* on orchids.

From Pennsylvania—

Coccus hesperidum on *Anthurium scherzerianum.*

From Utah—

Lepidosaphes beckii and *Phomopsis citri* on grapefruit.

SAN DIEGO STATION.

Steamship and baggage inspection—

Ships inspected	22
Fish boats inspected	28
Passengers arriving from fruit fly ports	73

Horticultural imports—

	Parcels
Passed as free from pests	7,833½
Fumigated	3
Refused admittance	½
Contraband destroyed	5
Total parcels horticultural imports for the month	7,842

Pests Intercepted.

From Belgium—

Coccus hesperidum and *Aspidiotus brittanicus* on bay trees.

From Kansas—

Crown gall and peach borer in peach and *Prunus* sp.

From New York—

Hemichionaspis aspidistræ, Coccus hesperidum, and *Pseudococcus longispinus* on ferns.
Aspidiotus sp. on orchids.

From Illinois—

Melanose fungus on grapefruit.

EUREKA STATION.

Steamship and baggage inspection—

Ships inspected	2

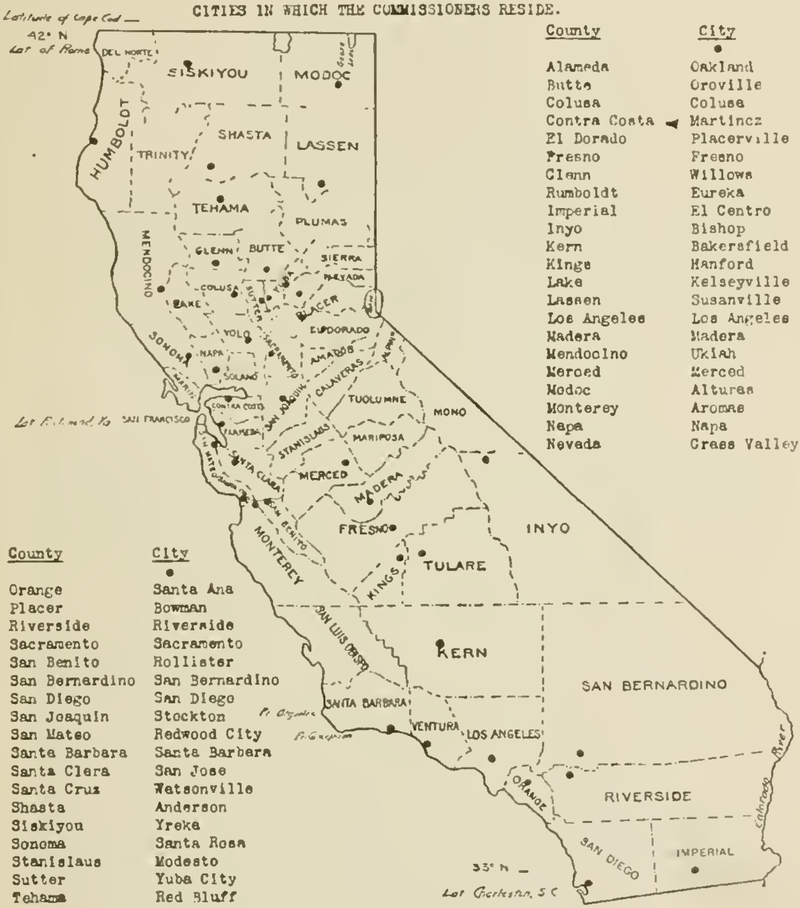
Horticultural imports—

	Parcels
	None.

SANTA BARBARA STATION.

(No reports.)

COUNTIES HAVING HORTICULTURAL COMMISSIONERS, WITH THE RESPECTIVE CITIES IN WHICH THE COMMISSIONERS RESIDE.


Latitude of Cape Cod —
42° N
Lat of Rome
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
NEVADA
COLUSA
LAKE
PLACER
YOLO
EL DORADO
SONOMA
NAPA
SOLANO
AMADOR
MARIN
CALAVERAS
CONTRA COSTA
SAN JOAQUIN
TUOLUMNE
MONO
SAN FRANCISCO
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
MADERA
SAN BENITO
FRESNO
INYO
MONTEREY
KINGS
TULARE
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
ORANGE
RIVERSIDE
SAN DIEGO
IMPERIAL
Colorado River
35° N —
Lat Charleston, S.C.

County	City ●
Alameda	Oakland
Butte	Oroville
Colusa	Colusa
Contra Costa	Martinez
El Dorado	Placerville
Fresno	Fresno
Glenn	Willows
Humboldt	Eureka
Imperial	El Centro
Inyo	Bishop
Kern	Bakersfield
Kings	Hanford
Lake	Kelseyville
Lassen	Susanville
Los Angeles	Los Angeles
Madera	Madera
Mendocino	Ukiah
Merced	Merced
Modoc	Alturas
Monterey	Aromas
Napa	Napa
Nevada	Grass Valley

County	City ●
Orange	Santa Ana
Placer	Bowman
Riverside	Riverside
Sacramento	Sacramento
San Benito	Hollister
San Bernardino	San Bernardino
San Diego	San Diego
San Joaquin	Stockton
San Mateo	Redwood City
Santa Barbara	Santa Barbara
Santa Clara	San Jose
Santa Cruz	Watsonville
Shasta	Anderson
Siskiyou	Yreka
Sonoma	Santa Rosa
Stanislaus	Modesto
Sutter	Yuba City
Tehama	Red Bluff
Tulare	Visalia
Ventura	Ventura
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H. B. Hopkins, *Watsonville*	Apple Inspector
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THE MONTHLY BULLETIN

Citrophilus Mealybug, *Pseudococcus citrophilus.*

OF

STATE COMMISSION OF HORTICULTURE

SACRAMENTO, CALIFORNIA MARCH and APRIL, 1917

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THE MONTHLY BULLETIN.
CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VI. April, 1917. Nos. 3 and 4

THE MEDITERRANEAN FRUIT FLY.*

By E. A. Back, Bureau of Entomology, Washington, D. C.

Ever since the days in 1899 and 1900 when Mr. George Compere, then traveling in the Antipodes, wrote to Mr. Alexander Craw of the destruction wrought by the Mediterranean fruit fly (*Ceratitis capitata*) and the Queensland fruit fly (*Dacus tryoni*) among the "plum, prune, peach, and apricot orchards" of Australia, and of the danger that these pests might be introduced into California, the progressive men of the Grizzly Bear State have been keenly alive to this danger that threatens them.

Fig. 15. View of Honolulu. An inventory of fruit fly conditions in Honolulu proved that on sixty blocks in the residential section shown above there were 4,610 trees, or an average of 6.5 trees to the dooryard, that bore fruits in which the Mediterranean fruit fly breeds. Many of these trees bear fruits ripening in greater or less quantities each month of the year. This condition exists within a four to fifteen minute walk from the docks from which steamers are sailing each week for San Francisco. (Original.)

That Compere's warning was no false one has already been proved by the space which the Monthly Bulletin has given to the problems which have arisen and have threatened California because of the introduction and rapid spread of the Mediterranean fruit fly throughout the Hawaiian Islands. The sending to these islands of Carnes and Weinland, by the California State Commission of Horticulture, and of Maskew, by the

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Federal Horticultural Board, for observation, and the expenditure of money by California in cooperation with the Hawaiian Board of Agriculture and Forestry in clean cultural work in Honolulu, are evidences of the genuineness of the danger that threatens. Furthermore, the frequent interception at San Francisco and Los Angeles, by the state and federal quarantine officials, of the larvæ or maggots of this pest in ships' stores and in the personal baggage of tourists on board ships arriving from Hawaii, as shown by the published reports of Mr. Frederick Maskew, of the Quarantine Division and of the Federal Horticultural Board, demonstrates the necessity for vigilant inspection at California ports of entry in carrying out and supplementing the quarantines of the federal government.

California fruit growers and students who have visited the Hawaiian Islands have seen the fruit fly working under conditions most ideal for destructiveness. On the other hand, Prof. H. J. Quayle, who investigated the fruit fly conditions about the regions of the Mediterranean for the Federal Horticultural Board, and the writer, who has visited the fruit growing regions of Spain, have observed the fly working under conditions much less favorable, and in many ways quite comparable to conditions found in certain places in California. While it is certain that the Mediterranean fruit fly will not find in California the ideal conditions for rapid increase and destructiveness that exist in littoral Hawaii, due to a more unfavorable climate and a less abundant array of wild or nonedible host fruits, it will become a serious pest. Aside from the actual damage that it may be able to inflict upon the fruit of California, its establishment in the orchards of the Pacific Coast will be a signal for the erection of "quarantine barriers by the Southern States against California fresh fruits subject to attack," and the damage thus brought about will be great. There will also be a partial loss of that prestige now enjoyed by California fruits when it becomes known that any peach, apple, orange or avocado exposed upon the hotel table, or in the market may contain decay and maggots even though outwardly beautiful.

So insidious is the nature of attack, and so numerous the avenues by which the fruit fly may be transported, the Federal Bureau of Entomology undertook in 1912 an investigation of fruit flies in Hawaii, the object of which, as pointed out by Dr. L. O. Howard in an address before the members of the University Club in Honolulu during 1915, was to safeguard the fruit and vegetable interests of California and the Southern States, as well as to accumulate data that would be serviceable in directing control should establishment in California occur. These investigations, inaugurated by Mr. C. L. Marlatt, assistant chief of the bureau and chairman of the Federal Horticultural Board, after a personal survey of Hawaiian conditions during August and September, 1912, have been conducted under his supervision by the writer, C. E. Pemberton, H. F. Willard and a varying number of inspectors.

HISTORY OF THE HAWAIIAN INFESTATION.

It is interesting that within about seven years after Compere's first warning to California, the Mediterranean fruit fly succeeded in bridging the distance between Australia and Hawaii. Although first discovered in Honolulu in June, 1910, it was probably introduced sometime during 1907. In 1910 the fly was known to occur only about Honolulu, but,

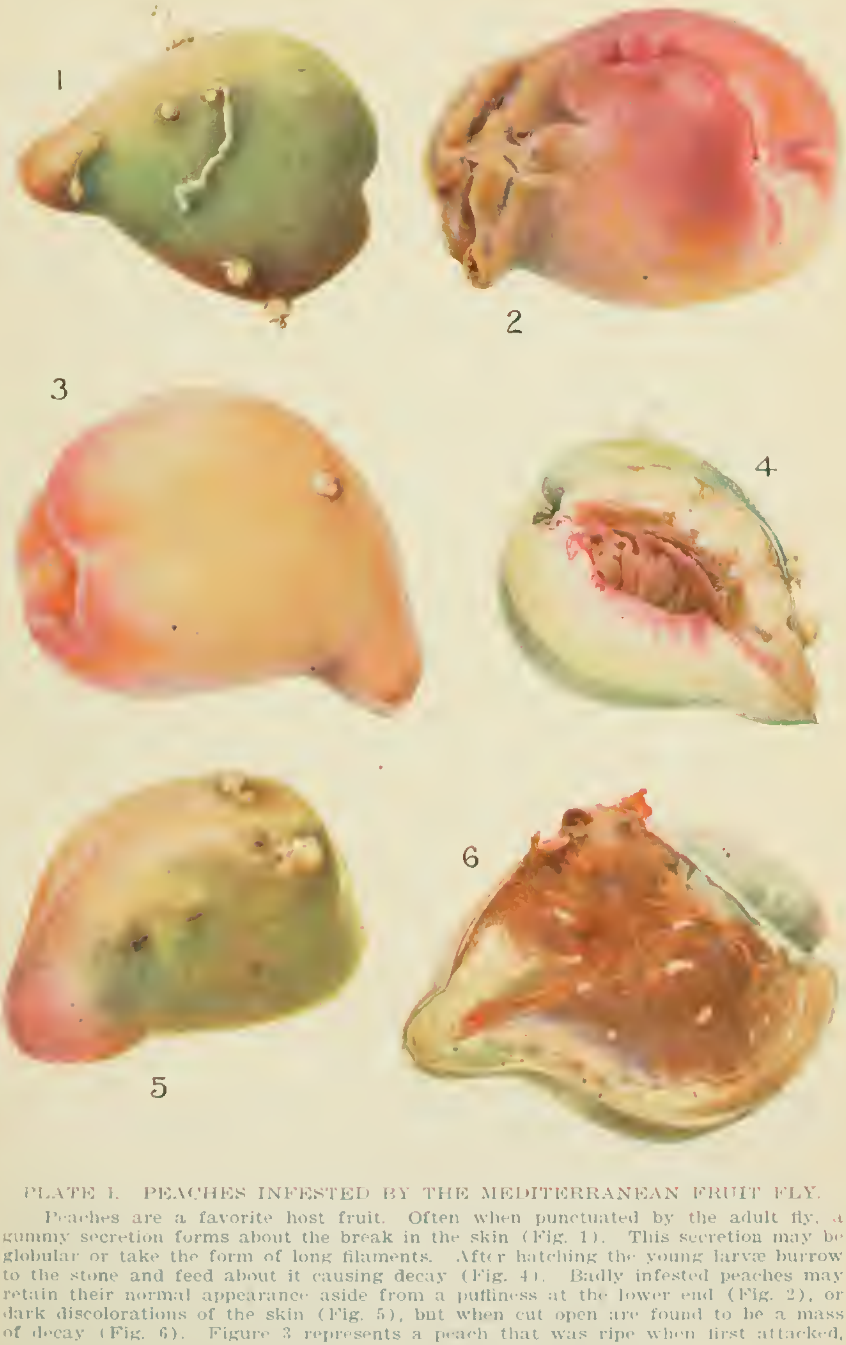

PLATE I. PEACHES INFESTED BY THE MEDITERRANEAN FRUIT FLY.

Peaches are a favorite host fruit. Often when punctuated by the adult fly, a gummy secretion forms about the break in the skin (Fig. 1). This secretion may be globular or take the form of long filaments. After hatching the young larvæ burrow to the stone and feed about it causing decay (Fig. 4). Badly infested peaches may retain their normal appearance aside from a puffiness at the lower end (Fig. 2), or dark discolorations of the skin (Fig. 5), but when cut open are found to be a mass of decay (Fig. 6). Figure 3 represents a peach that was ripe when first attacked, the gummy excretion being the only evidence of infestation within.

later investigations by Mr. E. M. Ehrhorn, of the Hawaiian Board of Agriculture and Forestry, found it to be more widely distributed. By 1912, it had succeeded in becoming established on all the larger islands of the Hawaiian group, and at present no section of the Islands is free from attack.

With this pest well established in South America, Africa, southern Europe, Asia Minor, and Australia, the North American continent is the "last large land area" upon which it does not occur. Yet its presence in the Bermuda and the Hawaiian islands brings the danger within easy range. It would appear that with the recent increase of travel that the fruit fly can not be kept out much longer except by the vigilant work of state and federal officials.

FRUITS AFFECTED.

The list of fruits, nuts and vegetables subject to attack by the Mediterranean fruit fly is a very long and important one. It includes practically all the ordinary fruits of commerce. The list of 12 fruits, given by Carnes in the first article published by the Monthly Bulletin, as harboring fruit fly in Hawaii, has been added to from time to time until at present the known Hawaiian hosts number 72. The latest addition to the list is the inedible berry of the wild Hawaiian sandalwood. As the complete list will be available soon in bulletin form, it will not be given here since it would occupy much space and contains many fruits and nuts not grown in California. It may be said, however, that almost any fruit in Hawaii may harbor the larvæ of the fruit fly, even though it be the nut of a palm, the berry of an ornamental shrub, or the edible fruit of some well known commercial species. Of the fruits of special interest to California growers, the following have been found variously infested in Hawaii: oranges, grapefruit, lemons, limes, peaches, apples, figs, apricots, bananas, mangoes, avocados, sapotas, loquats, persimmons, quinces, papyas, pears, plums, grapes, eggplant, tomatoes and cotton bolls.

SOME FRUIT HOSTS NOT BADLY INFESTED EVEN IN HAWAII.

The mere inclusion of fruits in any list of hosts does not tell the entire truth, and may often give a very false impression or even work an injustice. It is a satisfaction to record, therefore, that certain of the fruits listed above are of importance chiefly because they may carry the fruit fly larvæ under certain conditions, and not because they are rendered worthless by the fruit fly for ordinary local consumption within the quarantined area. Thus cotton bolls have not been found infested in Hawaii unless they have first been damaged by the pink boll worm (*Gelechia gossypiella*), and eggplants are so rarely infested that growers consider their fruits free from attack. An examination by C. E. Pemberton of 1,235 fruits proved but one to be slightly infested.

Grapes.

The Isabella variety of grape (*Vitis labrusca*) is commonly grown throughout the residential and badly infested portions of Honolulu, and commercially for wine on the Island of Maui, yet infestation among the berries, even when very ripe, is not sufficient to attract the attention of growers. A fruit fly inspector, specially detailed for the search, hunted four days during the harvesting season in Honolulu suburbs for berries that appeared infested. He found but 978 berries, and an examination of 201 of these, under a lense, made by H. F. Willard, brought to light only five larvæ of the fruit fly. Decay in most instances appeared to be due to bird pecks, cracking of the skin, and the decay that follows the work of decay flies (*Drosophilids*).

During the past harvesting season for "Malaga" grapes in Spain the writer examined many thousands of berries exposed for sale upon the markets of Seville, Granada, Valencia, Barcelona and Cadiz, without finding infestation except in one instance at Cadiz. In this last market a thousand berries were collected which, because of decay indications, had the appearance of being infested. An examination of their contents, however, proved them free from fruit fly larvæ, except in the case of a single berry, and that contained one well grown larvæ of *Ceratitis capitata*. It is very doubtful whether the grapes of Hawaii or Spain would ever become infested unless the berries were first injured by other agencies.

Avocados.

The avocado, the development of which has taken such strides during the past few years in California, is fortunately not one of the fruits that ordinarily become badly infested. Even under the most trying Hawaiian conditions infestation usually occurs so late in the development of the fruit that the infestation has progressed little by the time the fruits are softened enough for the table. It thus happens that, although local consumption is not interfered with, many thousand fruit fly eggs and very small larvæ are eaten unwittingly.

Pineapples.

The pineapple has been included by several entomologists among published lists of host fruits. Inasmuch as fresh pineapples are being shipped into California, it has been the purpose of the federal authorities to secure data that shall definitely place this fruit either among the non-host fruits, or among those subject to attack. No pineapple has been found in Hawaii infested with the Mediterranean, or any other, fruit fly. Fruits in all degrees of ripeness have been hung in jars containing female flies, but in no instance has infestation of the pulp resulted. Many larvæ have been transferred to pineapple pulp, but they were not able to subsist upon it and in all cases died, even though they had become quite well grown when transferred and were therefore very hardy. While there is a fruit fly in Australia that does attack pineapple, the pineapples of Hawaii at the present time are free from danger as transporters of the Mediterranean fruit fly within their pulp and must not be considered among host fruits. Inasmuch as fresh pineapples are shipped to the mainland they have been included in the quarantines of the Federal Horticultural Board in order that the danger of transporting the fruit fly in the wrapping material may be reduced to a minimum.

Papayas.

Papayas belong to a class of fruits that are well protected by Nature from fruit fly attack until they are quite ripe. The papaya fruit fly (*Toxotrypana curvicauda*), which is a pest of this fruit in Florida and Central American and West Indian localities, does not occur in Hawaii.

There is not one person in a thousand in Honolulu who knows that papayas ever become infested by the Mediterranean fruit fly, although the papaya is served upon practically every breakfast table in the city. This is because until the fruit is very ripe it is protected by a sap that is distasteful to the fly. The moment the adult pierces the skin of the papaya in order to lay eggs, a copious supply of this juice oozes out and either drives her away, or otherwise makes oviposition distasteful. It has also been found that unless the fruits are very ripe, or injured by decay, the eggs and young larvæ can not live in the pulp of the fruit, presumably because of the action of the sap. The well ripened papaya, however, may be badly infested. Between 100 and 200 flies have been reared from single fruits.

Bananas.

With the establishment of the Mediterranean fruit fly in Hawaii, it became necessary to determine to what extent the small but growing trade in export bananas from Hawaii to California jeopardized the fruit interests of the mainland. Considerable misleading information has been published in various literatures. During the past few years the susceptibility of bananas to the attack of *Ceratitis capitata* in Hawaii has been made the object of painstaking investigation, and the

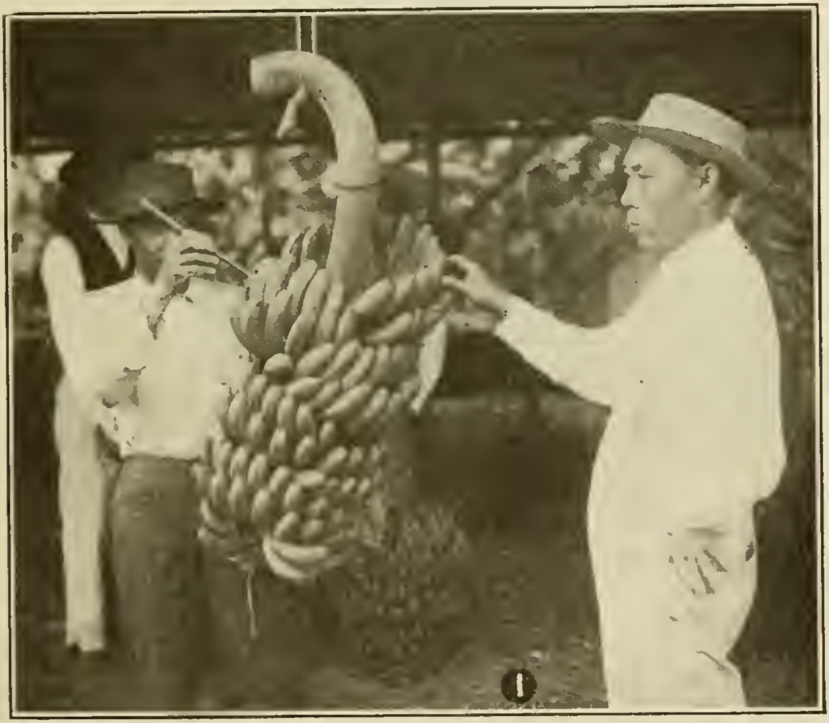

Fig. 16. Inspecting bananas in Hawaii. Before bananas are inspected by the Federal Horticultural Board each bunch is suspended from a rafter of the packing shed, or placed in some other favorable position, and then cleaned with the aid of a small brush or cloth attached to the end of a slender stick. During this process all prematurely ripe, cracked or decayed fruits are cut from the bunch.

Federal Bureau of Entomology has already published results which place the fruits of the Chinese banana and the Bluefield banana above suspicion as carriers of the fruit fly, provided they are harvested, wrapped and shipped in accordance with the demands of the trade and the regulations of the Federal Horticultural Board.

It is well known that the bunches of bananas must be cut on the plantations while they are still green in color, though well grown, and, from a trade standpoint, ripe. Because of the six to seven days required for transit between Honolulu or Hilo and California, and the time consumed in the harvesting and wrapping of the bunches on the plantations, the hauling of the fruit by wagon or railroad to the dock and the loading on board vessels, bananas must be cut in the field at least ten days before they would ordinarily turn yellow on the tree, even during the hottest Hawaiian summer weather. During the cooler seasons of the year this period between the time the fruit is marked for shipment and the time it would ripen if left in the field is greatly increased. The greenness of the fruit when cut for shipment is an important factor in determining the status of the banana as a host. It has been shown by many experiments already reported upon that the immunity of commercial species of bananas up to the time they must be cut to answer trade requirements, is not due to any lack of adult fruit flies among the banana plants while the fruits are developing, but to the astringent and tanin-laden sap in the peel of the fruit. In

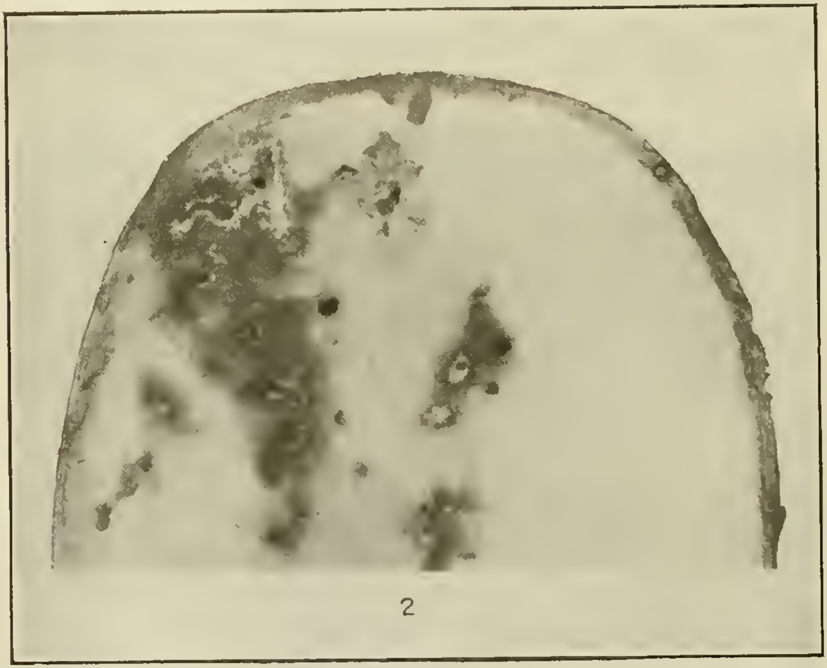

Fig. 17. Cross section of a Hawaiian cooking banana of the Moa type. Note that the larvæ of the Mediterranean fruit fly have tunneled their way through the pulp. Also note the comparatively thin skin of this type of banana. Because infestation of Hawaiian cooking bananas has been observed, the Federal Horticultural Board has placed a quarantine on all such bananas. (After Back and Pemberton.)

fact, the copious and sudden flow of sap that follows any attempt by the female fly to deposit eggs in these green, though well matured, fruits renders the successful deposition of eggs difficult and rare. In a few instances where eggs were deposited under forced and unnatural conditions, either the eggs themselves, or the newly-hatched larvæ, could not survive the action of the sap and the larvæ died without eating into the pulp.

The fact that not one of 1,044 fruits of the Chinese banana ripening simply and prematurely among bunches growing in the field, and in which, as in the case of other host fruits, one might expect gravid females to oviposit, was found infested, has led to the conclusion that even ripe bananas are not desired as host fruits by adult flies under Hawaiian conditions. On the other hand, the rearing of flies from the ripe and yellow fruits of the thin-skinned Popoulu variety, as well as from the ripe fruits of other varieties under forced and unnatural conditions, has led to the equally acknowledged fact that ripe bananas in the field may serve as hosts and should therefore be properly guarded against in all quarantine work. A more complete discussion of the relationship between the banana and the fruit fly can be had upon application to the Bureau of Entomology.

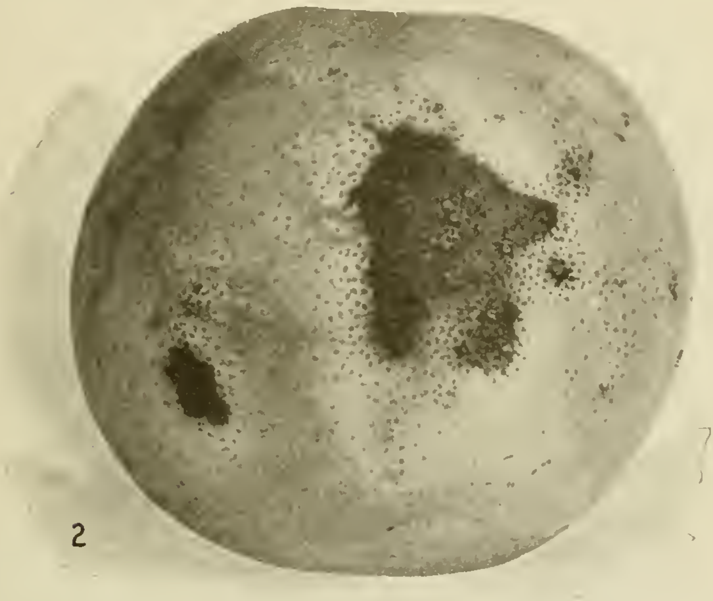

Fig. 18. Hawaiian grown sweet orange. The breaks made in the rind of citrus fruits by the female Mediterranean fruit fly are too small to be seen without a microscope when they are first made. As time passes, the tissues of the rind may remain fairly normal in appearance, except for a slight hardening about the injured point, or may wither and turn black as illustrated. This type of injury may appear in the rind while the pulp remains unaffected. During very damp weather moulds are quickly developed in these affected areas and the fruit breaks down rapidly. (After Back and Pemberton.)

FRUITS MORE SUSCEPTIBLE TO ATTACK.

Such other fruits as the fig, Japanese persimmon, apple, peach, pear, plum, sapotas, apricot, quince and citrus fruits are capable of supporting very heavy infestations of the fruit fly under conditions of climate and host relationships favorable to fruit fly increase. The commercial type of *Japanese persimmon* found upon the American market, which does not grow in Hawaii, was observed by the writer to be quite badly infested in Spain during last October and November in the suburbs of the cities of Barcelona and Valencia. The beautiful orange color of the fruits was defaced with a black discoloration wherever the fruit had been stung. Every *quince* exposed for sale upon the markets of Cadiz during October was infested in varying degrees, as also were many of the *apples* grown throughout the eastern and Andalusian portions of Spain. All lots of *peaches* upon the markets of Zaragoza and Barcelona were more or less infested during October, and all the highly colored *oranges* examined upon the heavily fruiting trees about Valencia and Burriana, and in the packing houses and freight cars bore fruit fly punctures in varying, though usually small, numbers. Tangerines in the markets of Alicante were found slightly infested. A general discussion of the susceptibility of citrus fruits has been published by the Bureau and is available to those desiring the results of extended observation.

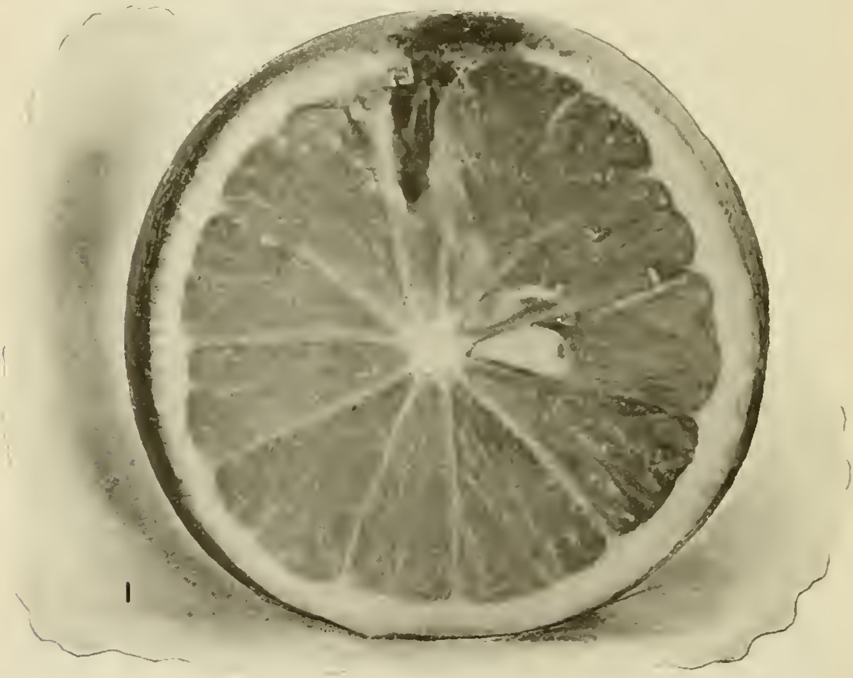

Fig. 19. Cross section of an orange. This fruit appeared perfectly sound, except for the blackened area in the rind on the upper side of the illustration. Upon being cut open, larvæ of the Mediterranean fruit fly were found feeding in the fruit directly beneath the discolored rind. Often many sections are thus affected in very ripe fruits. (After Back and Pemberton.)

NATURAL ADVANTAGES OF CALIFORNIA.

Among the many advantages that Nature has showered upon California, and which go to create the great optimism of the Pacific slope, there are those that will hinder the work of *Ceratitis capitata*. It is safe to say that should the Mediterranean fruit fly ever become established in California, it will meet with more natural and man-made barriers to its increase and spread than in any other country where it is at present known as a pest, for, in addition to all natural checks, it will have arrayed against it the concerted action of a well organized state and county inspection service which has authority to act speedily and effectively. One who has not become familiar with the multitude of trees and shrubs in Hawaii that bear fruits that serve as food for the fruit fly and which make possible, when assisted by the ideal Hawaiian climatic conditions, the remarkable destructiveness of the fruit fly in these islands, can not appreciate the great advantage California possesses in her natural dearth of native host vegetation and the checks which her climatic conditions will offer. By the wise elimination of a comparatively few host trees, the fruit fly in California can, in many important fruit growing areas, be made to struggle for its mere existence during a number of months when no fruits are in season in which it can multiply. And during these periods of scarcity of food, and of increased mortality, the poisoned bait spray, already demonstrated by Mally in South Africa to be effective, can be applied under ideal climatic conditions to further reduce the number of adult flies. The problem of control will be a serious one even with these natural advantages, yet it is comforting to realize that California's problem will not prove so hopeless a one as that of Hawaii during the past six years.

PARASITIC CONTROL.

An added advantage that will be California's is the large fund of information which is being accumulated upon the subject of parasitic control of the fruit fly in Hawaii by the Hawaiian Board of Agriculture and the Federal Bureau of Entomology. It will not be necessary for California to search the earth for parasites. This has already been done by the agents of the Hawaiian board, by such men as Silvestri, Fullaway and Bridwell. These men have introduced and established at least four parasites that have already demonstrated their ability to become worthy factors of control under Hawaiian conditions. Of these four, two came from western Africa, one from South Africa, and one from Australia.

The study being made of their biology by the federal bureau is bringing out facts that will be of value in determining which of those already established in Hawaii can be expected to give the best results when working under the cooler weather conditions of California.

The great success that has attended the work of the Hawaiian board, under the leadership of Mr. W. M. Giffard, in the search for, introduction and establishment of these parasites, has been one of the entomological romances of the time. During June, 1913, Mr. D. T. Fullaway, acting for the board, liberated a few specimens of the South African *Opius humilis* and the Australian *Diachasma tryoni* parasites among the coffee fields of the Kona district of the Island of Hawaii. But three females of the first species and nine females of the second species were liberated.

Yet, during October, 1914, Mr. Giffard and the writer found the parasites abundant throughout the coffee plantations which extended for about 15 miles in either direction from the point of original liberation. Coffee berries collected in November, 1914, by the writer from four places covering a range of about 30 miles, yielded larvæ of the fruit fly which were parasitized to the extent of 97.8, 98.1, 76.6 and 83.4 per cent, respectively. While the larvæ within thin-meated fruits are thus heavily parasitized, the work of the past three years indicates that those in the larger fruits are much less so. The parasitism among peaches, for instance, during 1916, as shown by Pemberton and Willard, amounted to but 9.1 per cent. It is, therefore, a question whether the excellent work of the parasites in killing the fly larvæ within such fruits as coffee berries will not be offset by their failure to work satisfactorily in such fruits as the peach or orange. Immense numbers of parasites are being reared and liberated continuously by the Island authorities, and it is hoped that the practical assistance that the parasites are already giving the coffee growers may later be brought to growers of other fruits. However, whatever the actual outcome of the Hawaiian situation, there will have accumulated for the service of mainland fruit growers such a fund of information upon the various phases of fruit fly control as was not available when the fight in Hawaii was first inaugurated.

WORK OF THE FEDERAL HORTICULTURAL BOARD TO MINIMIZE THE DANGER OF SPREAD TO THE COAST IN HAWAII.

The work of the Federal Horticultural Board in Hawaii was inaugurated during 1912. Upon the passage of the Plant Quarantine Act, which became operative on October 1, 1912, the federal government resumed responsibility for enforcing the quarantines established against the entrance at mainland ports of all Hawaiian fruits, nuts and vegetables subject to fruit fly attack.

For some months before this date, the Hawaiian Board of Agriculture, in cooperation with the California State Commission of Horticulture, had been endeavoring to lessen the opportunities for spread to the mainland by clean cultural work throughout the city of Honolulu, and by inspections of markets and ships' stores, and the baggage of passengers sailing for the mainland. In a way, this work was a huge experiment which depended for its successful outcome upon the hearty cooperation of the populace, since much of it had to be done without the support of federal or territorial law, and under most trying conditions.

Admirable as was the spirit behind these control measures, and earnestly as they were put into practice, all authorities interested in the subject of control, even the California official sent to Hawaii by the Federal Horticultural Board to investigate the situation, came gradually to realize that the energy and money expended upon this work in Hawaii would yield better results if concentrated on the inspection of ships from Hawaii entering coast ports. The excellent inspection service of California, already in operation in 1912, has been developed in cooperation with the Federal Horticultural Board until it has become the most complete system in existence.

Two phases of the work started by the Hawaiian authorities, have been continued and perfected by the Federal Horticultural Board. They pertain to the certification of banana and pineapple shipments to California and the problems arising in rendering these as free from

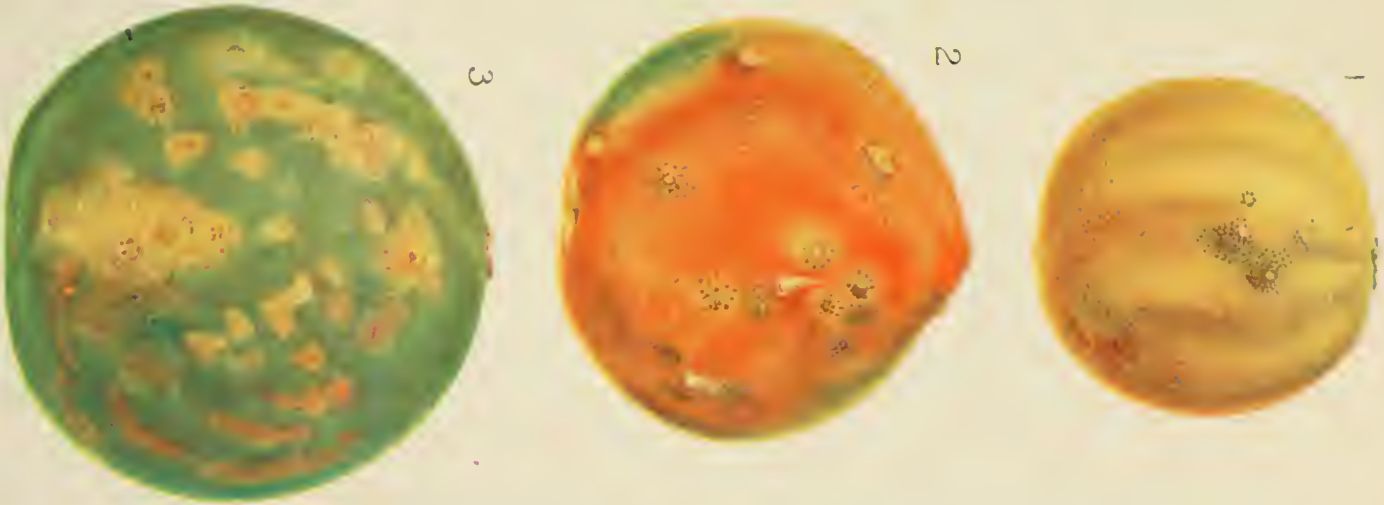

PLATE II. CITRUS FRUITS ATTACKED BY THE MEDITERRANEAN FRUIT FLY.

The three fruits illustrated are not infested with larvæ in pulp, although they show various discolorations of the rind due to punctures made by the female fly. The discolorations about punctures do not always occur, but those illustrated of the common lime (Fig. 1) and the Kusai lime (Fig. 2) which are normally yellow and bright red, respectively, when ripe, are commonly seen in Hawaii. The discoloration of the rind of the green, though well grown orange (Fig. 3) are excessive even for Hawaii, although many fruits can be found in Honolulu that have many more punctures in the rind.

danger as carriers of fruit fly as any shipment of a commercial nature can be made.

The regulations prohibit the shipment of all host fruits from Hawaii to the mainland except the Chinese and Bluefield bananas and pineapples. No bananas or pineapples may be shipped from any plantation or field which has not been inspected by an official of the Federal Horticultural Board to determine that conditions in and about such places of production, and about the packing houses and sheds adjoining, are sanitary from a fruit fly standpoint. These inspections include the supplies of wrapping media and the sources from which they are obtained. After having had their plantations inspected, those desiring to ship fruit must notify the federal officer in charge in Honolulu, sufficiently far in advance, of the location and amount of fruit to be offered for shipment, the name of the consignor and consignee of each shipment, the name of the ship by which it will go forward to the coast, and the date of sailing. With these data, inspections are arranged for the various plantations so that each bunch of fruit may be inspected for the removal of all prematurely ripe, split, bruised or decayed fruits, and inspection tags attached to each bunch or crate of fruit offered to the transportation companies.

After inspections of the fruit have been made and the inspection tags attached, permits are issued in triplicate to the transportation companies permitting them to accept consignments of fruit answering the description given in the permit. The original of this permit is attached to the bill of lading, while the duplicate and the triplicate remain in the files of the transportation company and the Federal Horticultural Board respectively. Upon arrival at the Coast, no fruit consignments are permitted to leave the ship until the permit attached to the bill of lading has been examined by the board official at the port of entry to make certain that the information as to amount and destination agree with the consignment on board.

The work of the Federal Horticultural Board in Hawaii has met with the hearty cooperation of all parties concerned. Even the express companies will not knowingly accept fruit not bearing an inspection tag. Only those familiar with the infinite patience of the Oriental, can appreciate the thoroughness with which the bunches of bananas are cleaned by the Chinese growers, to whom great credit is due.

ON BOARD SHIP.

It has been found impossible thus far to prohibit ships' stores being taken on board at Honolulu, or to prohibit passengers from carrying with them on their voyage delicacies in the nature of fruits. The transporting companies and individuals are, however, liable to fine or arrest provided contraband material is found in their possession by the federal officers after the ship arrives within the three mile limit of the mainland. At present, slips containing fruit fly information are distributed to each passenger. In the future, each passenger will be required to sign a statement that he has no contraband material in his baggage or upon his person. The most difficult task of the officials at California's ports of entry is the detection of fruit fly coming from ships' stores and the baggage of travelers.

CONCLUSION.

No attempt has been made in this paper to give a full account of the Mediterranean fruit fly. Only a few of many interesting phases of the problem have been touched in an attempt to call attention, possibly in a new manner, to the seriousness of the situation threatening the more tropical portions of the mainland United States, and to indicate that everything is being done that can be done by the federal and state officials to prevent establishment in California. With the fruit fly knocking continuously at the gates of San Francisco and Los Angeles, it behooves all interested to inform his neighbor concerning the fruit fly, for it is the unthinking and uninformed traveler returning from the Islands—perhaps with a few exotic (and infested) fruits in his baggage or pockets—that is most likely to introduce the pest to California.

PRUNING FRUIT TREES.

With Special Reference to the Apple.

By W. H. Volck, County Horticultural Commissioner, Watsonville.

For the past four years much of my time has been devoted to developing a satisfactory system of pruning for apple trees under California conditions. Such pruning involves many difficulties, and not only must the tree be kept properly thinned, but special care should be taken to prevent infection by the wood-rot fungus.[1] Wood rot is one of the principal enemies of California fruit trees, and is a factor which largely determines the life of an orchard.

Wood rot is especially in evidence in the Pajaro Valley, the locality where this experimental work has been conducted.

These pruning experiments were started in connection with the "Apple Powdery Mildew Investigations," conducted jointly by the United States Department of Agriculture and the Santa Cruz County Horticultural Commissioner.[2] As such, the pruning was especially designed to remove mildew-infested twigs in order to facilitate the control of this disease.

From this beginning the work has been continued as a general study of pruning methods, and we have been especially fortunate in securing a plot of Yellow Newtowns on which these experiments could be continued from year to year.[3]

Considerable progress has been made towards a satisfactory solution of the pruning problem, and while the investigation is by no means complete, it appears advisable to make the findings public. In doing so I am aware of the difficulty involved in description of these methods in such a way as to make them intelligible to those who might wish to apply them. If it were possible for the fruit growers of the state to visit the experimental plot and there see the work in progress they could easily and quickly understand it.

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[1] A species of *Polystictus* most commonly found in the wood-rot cankers has been described by C. J. Rodgers, University of California, 1914, in Studies on Sappy Bark Disease of the Apple. This work is also referred to by W. T. Horne, Circular No. 137, California Agricultural Experiment Station.

[2] The beginning of the pruning work was referred to in Bulletin 120, Bureau of Plant Industry of U. S. Department of Agriculture, entitled Apple Powdery Mildew and Its Control in the Pajaro Valley.

[3] This experimental work has been conducted in a block of Yellow Newtown trees located on the C. H. Rodgers estate near Watsonville, California. The work was begun during the life of Mr. Rodgers, who extended every aid possible. This same policy has been continued by his heirs, and has made possible such success as we have attained.

In lieu of such a visual demonstration I am attempting to convey the same explanation by a number of drawings.

Figure 20*a* shows a young tree that has been well started with three principal branches, but which requires pruning to train it in the way it should go.

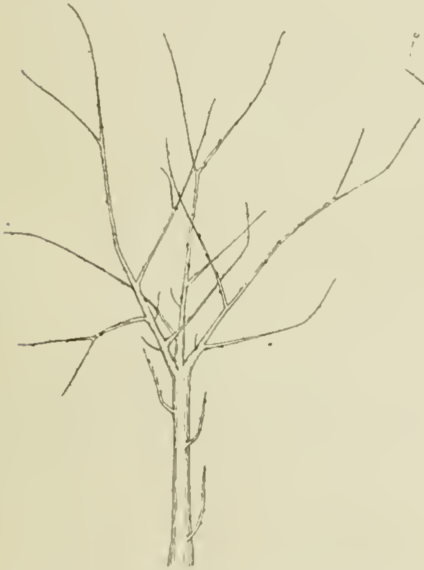

Fig. 20*a*.

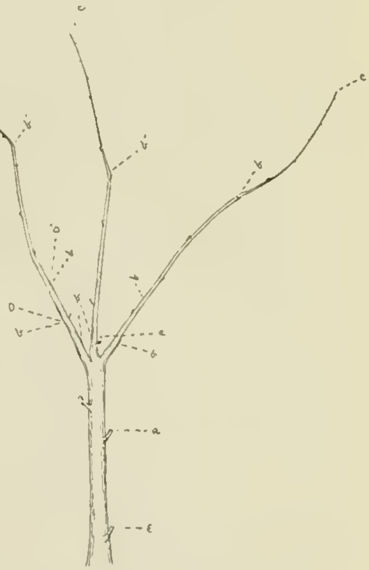

Fig. 20*b*.

Fig. 20*a*. A young tree started with three main limbs. The branches are well placed to give light in the center of the tree. (Original.)
Fig. 20*b*. The same tree as in Fig. 20*a*, after pruning. (Original.)

Figure 20*b* shows this tree pruned according to our ideas. The suckers (*a*) have not been removed, but cut back with the idea that they will continue to grow and afford shade to the trunk and main branches. Those on the branches may ultimately become fruit spurs if properly handled. Of course, the water sprouts on the trunk are not intended to remain indefinitely, but should be removed before too large a cut is required. The limbs (*b*) have been removed because they would ultimately be in the way and because they should be cut off before they have attained a size which, when cut, would leave too large a wound. The limbs at (b^1) have been cut out to keep the center of the tree open and develop the leaders (*c*). While the forks at (b^1) may not appear out of place they should not be of equal value, that is the leader should be much the stronger. If it should, later, appear that a fork at (b^1) is desirable it can be developed from a water sprout. In this figure I have not indicated the cutting back of the leaders (*c*). These may be left as they are or headed back about half way. I am inclined to think the former method is best for young trees.

The cuts, as indicated, are made very close to the main limbs. These branches are of a size easily handled with a shears but it is best to make the cuts with a saw in order that they may be as close as possible to the main limb. The closer the cuts the quicker they will heal, with correspondingly less likelihood of infection by the wood-rot fungus. In making cuts, the matter of healing should always be considered according to the following points.

When a lateral is removed from the underside of a limb the cut will heal quicker than the same sized cut on the upper side of the limb; illustrated by D and D[1] (Fig. 20*b*). Cuts made at forks where the limbs are of equal value are slow healers especially where the cuts are on the upper side as at (b^1). This is one of the reasons for making the cut at (b^1) while the limbs are still small. The small cuts on a young tree will usually heal without any special attention or treatment, but even here it may pay to treat them as described later.

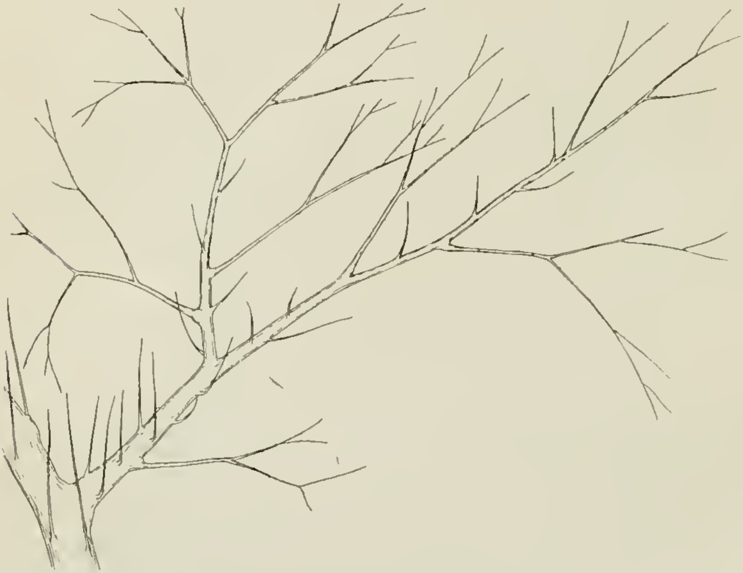

Fig. 21*a*. Diagram of a limb from an older tree, showing an excess of lateral growth. (Original.)

The same general method should be pursued from year to year, and if consistently followed will develop a tree from which no large limbs will have to be removed. The tree will be open and the main limbs covered with fruit spurs which have been developed from water sprouts. Before leaving the subject of pruning young trees it is well to state that much can be done by summer pruning or nipping. In this way undesirable growth can be prevented, and the entire growth directed as desired.

The height of the trunk is also a matter to consider. The question of low or high headed trees is so involved that the writer prefers not to take a decided stand. It appears to me that the advantages in each case are largely offset by corresponding disadvantages. One thing is certain, that is, a high headed tree can more easily be converted into

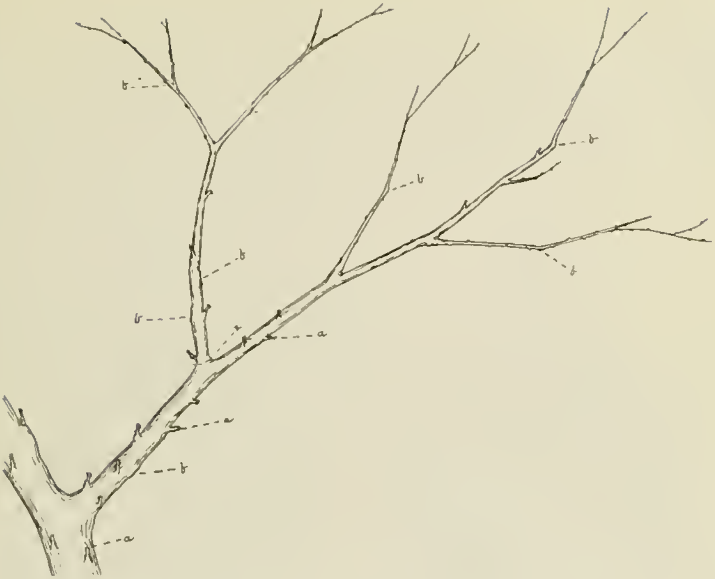

Fig. 21*b*. The same limb as in Fig. 21*a* after the water sprouts and unnecessary laterals have been removed. (Original.)

one with a low head than the opposite. For instance, if the water sprout (*c*) were allowed to develop it would soon produce a very low headed tree in the case in point.

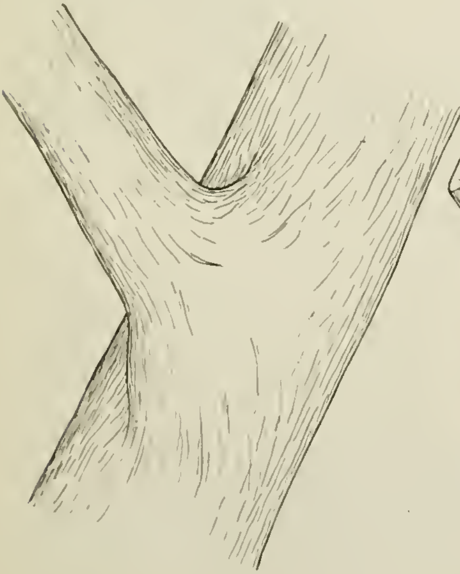

Fig. 22*a*.

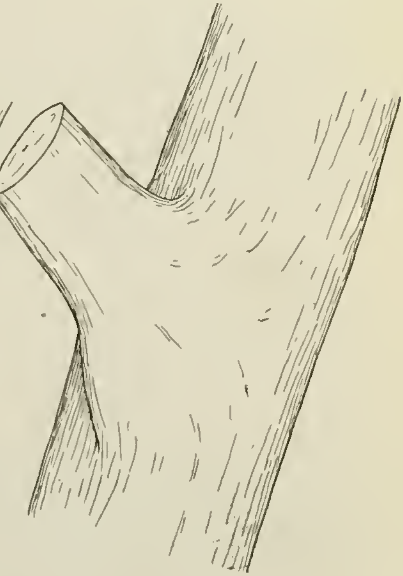

Fig. 22*b*.

Fig. 22*a*. A limb with a large branch to be removed. Fig. 22*b* shows the same limb after the preliminary cut. (Original.)

PRUNING THE BEARING TREE.

Figure 21*a* is a diagram of a limb in a bearing tree at the end of the growing season, and which requires considerable pruning both for the present and future needs.

Figure 21*b* shows this limb pruned in accordance with the ideas already advanced. The water sprouts (*a*) are stubbed off short so that they will continue to grow and furnish shade, and also may be developed into fruit spurs. The cuts (*b*) are made with the same general idea of keeping the tree open as already explained. These cuts were all made with reference to the chance of healing. From the standpoint of the future tree it would be best to cut off the limb at (x), but this kind of a cut heals with difficulty and is therefore not advised. The same system is followed over the entire tree, and as can be seen, amounts to a thorough pruning.

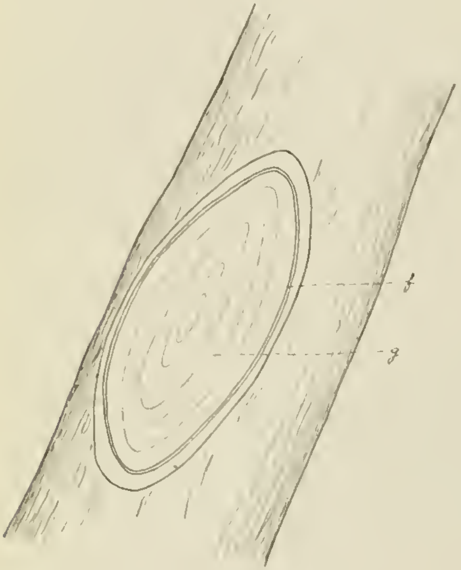

Fig. 22c.

Fig. 22*c*. Same limb as in Fig. 22*a*, showing the final cut, close to the main limb and ready for treatment. (Original.)

The heading back of leading tips is a matter which depends largely on circumstances. Of course, all mildewed and otherwise diseased tips should be cut off well below the infection. Leaders which one wishes to develop may be left untrimmed, but where (especially on the tops) the growth has reached its desirable limit, liberal heading back should be practiced.

All large cuts should be made very close to the main limb and properly treated as described later.

MAKING AND TREATING LARGE CUTS.

Figure 22*a* shows a limb with a large branch to be removed. Figure 22*b* shows the preliminary cut, and one which is often the ultimate cut as seen in many examples of poor pruning. This preliminary cut is made to facilitate the work on the final cut and obviate the danger of splitting down.

Figure 22*c* shows the final cut, close to the main limb and ready for treatment. After making the cut with the saw the living bark layer (*f*) is cut down smooth against the wood (*g*) with a sharp knife.

Figure 22*d* shows this bark layer covered with a thick coating of asphaltum-paraffine grafting wax which prevents the drying out of the cut surface. This treatment prevents the dying back of the bark and allows it to start growing over the wood (*g*) at once. The coating should be applied immediately after the cut is made. The greater part of the wood (*g*) should not be covered for reasons which will be explained later.

Figure 22*e* shows the exposed wood (*g*) driven full of copper nails or tacks. These nails are to remain permanently in the wood, and through their gradual solution and germicidal action prevent wood rot infections. The tacks may of course be driven just before applying the asphalt coating to the edge of the cut.

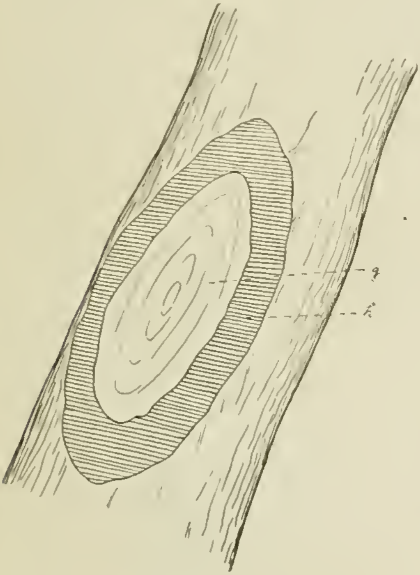

Fig. 22*d*.

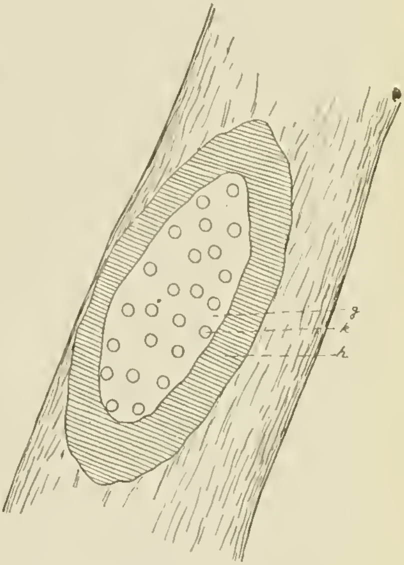

Fig. 22*e*.

Fig. 22*d*. Same limb as in Fig. 22*a*, showing the bark layer (*f*) covered with a thick coating of asphaltum. Fig. 22*e* shows the exposed surface of the cut driven full of copper nails or tacks. (Original.)

The final treatment consists in painting the exposed wood (*g*) with Bordeaux whitewash. This Bordeaux application should be repeated every fall to fill up the cracks which may develop in the wood (*g*) so supplementing the action of the copper nails.

Figure 23 shows a longitudinal section of a cut prepared as described above.

Figure 24 shows an additional feature of a copper wire screen (*j*) fastened down to the wood (*g*) with the copper nails (*k*). This screen affords considerable additional protection and is almost necessary on very large cuts. One important point is that the Bordeaux wash sticks much better to such a screened cut.

Figure 25*a* shows a longitudinal section of an old stub (*l*) with a cut which was improperly made and which has resulted in a serious wood rot infection. In this figure (*m*) represents dead and cracked bark, (*n*) rotted wood extending into the main limb, (*o*) the present limits of living bark and sound wood, (*p*) cracks extending into the main limb from the dead stub.

Fig. 25*b* shows the just-described limb after treatment. In this figure (*r*) represents the depth to which the wood was cut out to reach sound wood. The region (*p*) is a heavy plaster of Bordeaux paste applied to the depths of the cavity to act as a disinfectant. The cement filling (*q*) is set firmly against the wood at (*s*). The face of this cement filling is well below the bark layer so that the new bark can grow out over its surface and so hold the filling tightly in place. The (*h*) indicates the usual asphaltum wax coating over the cut edge of the living bark.

Considerable skill is required to make such a filling, and the proper technique is only acquired after practice. The first step is to cut a deep line around the edge of the living bark with a chisel. The chisel cut should be driven well into the wood so that the living bark will not be in danger of being peeled off during the operation of removing the rotted wood. Chisels are then used to cut out the rotted wood, which should be removed completely or until the sound, white wood of the interior of the limb is exposed. Frequently, the rotted wood in the limb will be found to extend considerably below and above the limits of the living bark about the dead stub. In such cases it is necessary to make a long, narrow cut of sufficient length to remove this rotted wood. Sometimes the final limits of the rot may be removed with an auger.

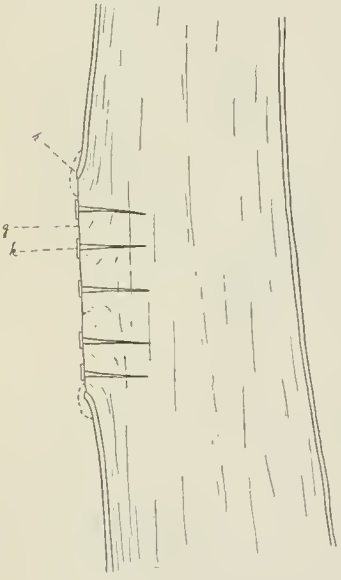

Fig. 23.

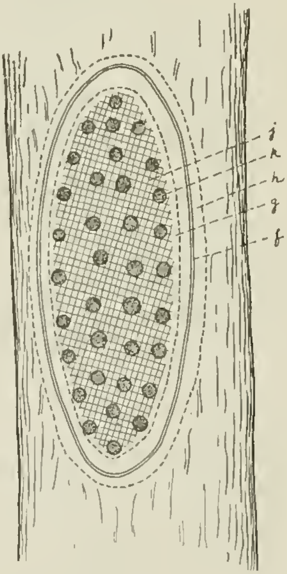

Fig. 24.

Fig. 23. A longitudinal cut through the limb shown in Fig. 22*c*.

Fig. 24. The same as Fig. 22*c*, with the additional feature of a copper wire screen, which gives further protection against rot fungus. (Original.)

After the cavity has been cleaned the Bordeaux paste is applied to the walls and the cement filling put in place. The edges of the cut are now smoothed with a sharp knife and the asphaltum wax applied. The cement should be allowed to set a little before this last operation.

Figure (26) A is a diagram of a tree in which a large limb has rotted down into the trunk from the old cut (F).

Figure (26) B shows this limb removed. (H) is the surface of a cement plug filling of a cavity excavated by means of auger and chisel. The heads of copper nails (*k*) represent large nails driven deep into the wood. The usual asphalt protection for the edge of the cut is represented by (*h*).

In the figure (26) A and (26) C the letters (A) and (A′) indicate preliminary cuts, (B) and (B′) final cuts, but (B) is a very poor cut, while (B′) is the proper one. In the same way (C) and (D) indicate good cuts with the preference for (C), but the limb should never be cut off at (E) as a permanent cut.

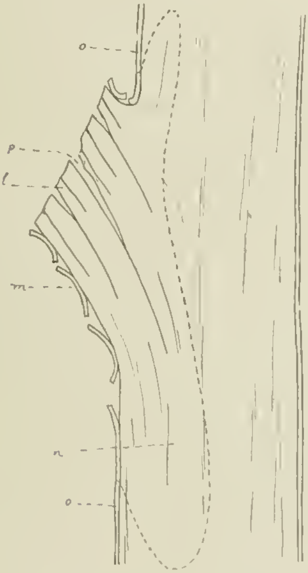

Fig. 25*a*.

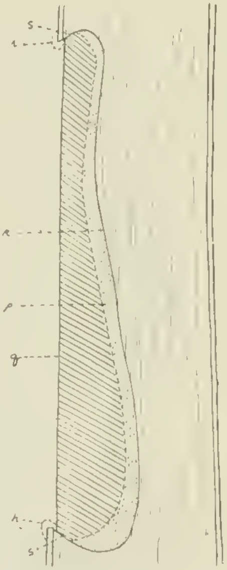

Fig. 25*b*.

Fig. 25*a*. Longitudinal section of an old stub which was improperly treated. Fig. 25*b* is the same wound as Fig. 25*a* after treatment. (Original.)

MATERIALS USED IN TREATING CUTS.

The asphaltum-paraffine mixture is composed of grade (D) asphaltum and paraffine wax at the rate of eight parts of asphaltum to two parts of paraffine by weight. These ingredients are melted together until thoroughly mixed. The addition of paraffine to asphaltum lowers the melting point of the mixture and otherwise improves its physical properties. Lower melting points are obtained by increasing the quantity of paraffine, but it is not desirable to have too soft a wax which will run badly in the sun's heat.

I have found this wax to be superior to any other compound within my experience. It never hardens or cracks, it does not injure plant tissue, and is easily applied when moderately heated. This mixture is also an excellent grafting wax.

The Bordeaux whitewash used in these experiments was made by thinning commercial Bordeaux paste with suitable quantities of water.

The undiluted paste was used as a backing for cement fillings. Concentrated Bordeaux mixture can also be prepared on the farm by combining equal weights of bluestone and lime dissolved and slaked in small quantities of water. Such mixtures become very thick or stiff and require thorough stirring.

The cement used in our experiments was a medium setting Portland cement mixed half and half with sand. A quick setting cement might be preferable at times. The cement should be mixed in just such quantities as are required for immediate use.

The copper nails used were of many kinds, varying from spikes to tacks. Copper nails are difficult to obtain; tacks ¾ to 1 inch in length are obtainable through the hardware trade, and larger nails up to 4 inches in length from the ship building trade. We also used iron nails and iron nails heavily copper plated. The plated nails are very useful, especially in the large sizes, where the solid copper nail contains an unnecessary amount of copper and is difficult to drive in hard wood. These plated nails are not obtainable from any source known to the writer, but should this system of treating cuts become popular they will probably appear in the hardware trade. Brass nails have also been used, but copper is preferable.

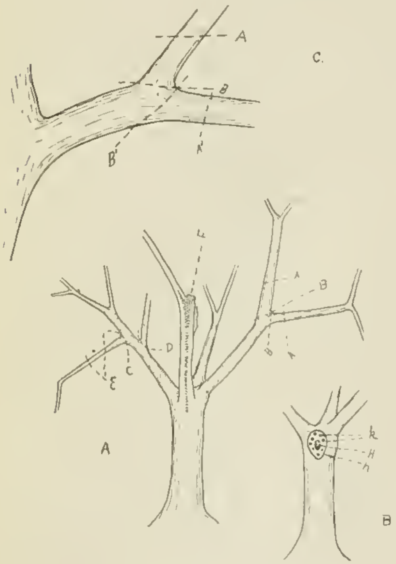

Fig. 26 A, B, C. Diagram of a tree in which a large limb has rotted down into the trunk from the old cut (F). B and C show the limb removed and the method of treatment.

Copper window screen is now obtainable through the hardware trade. This copper screen is a very useful supplement to the copper nails, and where these nails are not obtainable copper screen and iron nails may prove a good substitute.

A varied assortment of tools is necessary, especially in excavating cavities. Round and flat chisels, hammers, mallets, a ratchet brace and several sizes of bits, pliers, tin shears, etc., as well as good pruning shears and saws enter into such an assortment.

SOME SUPPLEMENTARY REMARKS.

The proper treatment of cuts and limb stubs is a complicated matter, especially under our local conditions which favor wood rot and retard the natural healing process. Formerly such treatment consisted in the application of some kind of paint to the entire surface of the cut. This painting appeared to be the proper thing in that the cut could be sealed, thus presumably protecting it from infection. In this it failed, however, owing to the fact that the sap pressure behind the painted surface is nearly always sufficient to rupture it. At the same time the paint retains enough of the sap to keep the wood saturated and provide an excellent medium for the growth of the wood rot fungus[4]. It so happens that the most impervious paints have proved to be the poorest protection against wood rot infection.

In the method described in this paper, the greater portion of the cut is left uncoated in order to avoid these stagnant sap accumulations. The Bordeaux whitewash application is pervious and so does not retain the sap.

The use of copper nails is the outcome of a long series of experiments in the effort to find some disinfectant which would remain effective for a very long time.[5] Sufficient time has not yet elapsed to demonstrate what the ultimate outcome of this method will be, but it looks very promising at present. We have opened up some of the older wounds, so treated, and found no wood rot. At the same time the bark cover over the surface of the wound was developing at a satisfactory rate.

Another drawback to painting has been the fact that the paints frequently prove injurious to the bark tissue, killing it back, thus greatly delaying, and in many instances absolutely preventing the healing of the wound. In one instance a red-lead paint induced serious wood rot the very season it was applied.

As a protection to exposed bark tissue the asphaltum wax is vastly superior to any other material which has come to my notice. This wax causes no injury to the bark tissue, but on the contrary, growth is apparently stimulated by its presence. From these considerations it might be a good practice to keep the edge of the overgrowing bark continually coated with the wax, by an application every year.

Referring back to pruning I wish to add a few words regarding the development of the so-called "suckers" or "watersprouts" into fruit spurs. If these suckers are kept pruned back, quite short, every year, they will throw out laterals and produce blossom buds. In the experimental plot we now have many fruit spurs which have been developed in this way. It is thus possible to maintain a bearing surface on all the large limbs, and near the ground. The shade afforded by these spurs will largely prevent sun burning and so permit the maintenance of a very open head. Of course, these spurs will eventually outgrow their usefulness and will have to be replaced by new spurs. This thinning out of the older spurs should be done before they have attained a size sufficient to give trouble in treating the cuts.

These sucker spurs are probably not the thing in a region where pear blight is a serious disease, but they are certainly very promising under California coast conditions.

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[4] When I noticed this tendency of paints to induce wound-rot I advised the growers to discontinue the use of any paint on limb stubs and saw cuts. Many growers have followed this advice with good results. Very few such untreated cuts have rotted and, so far as I have observed, none at all where the cut was properly made. The fact that these untreated cuts may rot in time is admitted and is the reason for the attempt at permanent disinfection as described in the text.

[5] The heads of the nails are indicated resting on the surface of the cut. In time these projecting nail heads may give trouble by being forced into the overgrowing bark, in which case they should be driven down with a nail-set.

WEED CONTROL ON STATE HIGHWAY RIGHT OF WAY.

By A. B. FLETCHER, Highway Engineer, Sacramento.

The removal of vegetation from the right of way of the state highway is a task much like that given to Tantalus, one that can never be completely finished. The weeds may be entirely removed from the highway and yet not on the adjoining fields, so that the following season the highway may produce a very rank growth from the weed seeds of the fields.

There are quite a number of weeds and grasses that are a benefit rather than a detriment when growing along the cuts and fills and shoulders of the highway. Often these same weeds are very undesirable to the agriculturist and the highway right of way must not be allowed to be a breeding place for such weeds.

The total area of much of the right of way is approximately nine acres per mile of highway. Of this nine acres about one-third is free of weeds, due to the hard surfaced pavement and traffic. The remaining six acres are in two narrow strips, roughly about twenty feet wide.

In the removal of weeds a number of methods have been tried with varying degrees of success. The weeds have been cut by mowers just prior to the ripening of their seeds. This method is relatively rapid and inexpensive. Its disadvantages are the accumulation of dried weeds with the consequent danger of fire, difficulty of handling a mower along such a narrow strip with guard rails, telephone poles, fences and culvert head walls to be dodged, and finally the mower does not kill the more sturdy weeds and the cutting back seems to make them almost more vigorous in their growth. Hand scythes have also been used with much the same results as with the use of a mower.

In some sections the weeds have been grubbed out with grubbing hoes and this method has resulted in the killing of the weeds for the season but the right of way usually produces a new crop the following year from seed from the adjoining fields. In this case also the dried dead material is a fire menace to the farm fences, telephone poles and guardrails.

Gangs of men have been employed to burn off the weeds as soon as they were dry enough to be handled in this way, but labor of protecting poles, fences and guardrails with wet sacks has made the method expensive. Also the weeds when dry have usually scattered their seed and if they are of a kind objectionable to the farmer the burning method is likely to be utilized too late to be entirely satisfactory.

There are so many things that influence the cost of destruction of weeds along the highway that any attempt to give the average cost per mile for any of the methods described would very likely be misleading. The irregularity of the surface of the ground with protruding rocks or boulders may make mowing by machines almost impossible. Thickly settled regions, in which improvements are found close to or along the right of way, may make the burning of the weeds too great a risk.

Each section of highway presents its own weed problem and in time the cost data and results will prove what methods of destruction are best.

Some of the division engineers of the California Highway Commission have commented on this subject as follows:

Mr. F. G. Sonner, headquarters, Willits, says: "In the summer of 1915 we obtained authority under Maintenance Requisition No. 186 to expend $985 in cutting weeds and burning grass. At that time, on portions of the completed road, grass and weeds had grown so rank on the slopes and shoulders as to be very unsightly and in case of the grass when dry, there was danger of fires being set from the road.

"The grass was burned, generally at night, and the weeds cut with a road drag, grader and grubbing hoe.

"Unless dog fennel is so considered, probably the only noxious weed along the roads in this division is what we believe to be the Scotch thistle which grows in Humboldt County, particularly on parts of I–Hum–1–D. Those along the road were cut in 1915, but as they grew thickly beyond the limits of the highway, the effect as far as their extermination is concerned is nil."

Mr. W. S. Caruthers, headquarters, Sacramento, says: "On account of lack of funds practically the only work done in this division towards the removal of noxious weeds has been an attempt to eliminate the Yellow Star and other thistles on several sections of highway in two counties where our cooperation was requested by the horticultural commissioners.

"In Solano County a mowing machine was used and the thistle cut as close to the ground as possible with such a machine. Very unsatisfactory results were secured here, as within two weeks the weed had grown six inches and apparently had more blossoms than ever.

"In Yolo County a more vigorous effort was made at removal; here burning and hoeing were resorted to.

"This thistle has a joint close to the ground and can not be touched by mowing but must be hoed. A great deal of Yellow Star and other thistles are to be found along the highways in this division, in some cases almost solid banks being found from the edge of the concrete to the right of way lines for long distances. It will probably cost several thousand dollars a year to handle them if some method of eliminating the pest is not found."

EXPENDITURES TO DATE.

Sac–4–A	$4 50
Sac–4–B	4 50
S.J–5–A	3 25
S.J–5–B	9 75
Sol–7–A	43
Sol–7–B	77 30
Sol–7–C	83 30
Sol–7–D	77 31
Yol–6–A	207 44
Yol–6–C	18 54
Yol–7–A	326 59
Total to date	$812 91
Other weed removal, such as around guardrail, etc.	109 19
Total expended on weed removal	$922 10"

Mr. W. Lewis Clark, headquarters, San Francisco, says: "On all sections an attempt has been made to eliminate mustard, thistles and poison oak.

"Clearing of right of way in varying degrees of completeness has been carried out over approximately 60 miles of roadway by the methods and at the cost shown below:

Length	Method	Cost per mile	Totals
48.2	Mowed with machine	$3 50	$168 00
7.0	Mowed with scythe	3 50	25 00
4.0	Burned	10 00	40 00
.8		40 00	30 00
60.0			$263 00

"The use of a mowing machine is not satisfactory for the following reasons: unevenness of roadside, obstructions such as guardrails, power and telephone poles, material cut is left alongside road and is more readily exposed to danger of fire.

"The scythe was used only to cut the larger growth, such as mustard and thistles, covering approximately 10 per cent of area. A thorough cutting would be difficult and expensive on account of tough grass. Cut material would then be left alongside road.

"Burning is the most satisfactory in that the appearance of the roadside is better, abutting property is protected from fire and the weed seeds are destroyed.

"Roadside structures, poles and fences are protected by wet sacks. Four laborers will burn off about one mile per day."

Mr. Walter C. Howe, headquarters, San Luis Obispo, says: "During 1916 the total expenditure for the clearing away of weeds along the highway right of way amounted to $190.34, or practically $1 per mile of road under maintenance.

"In this division there are many long stretches of highway right of way practically free from noxious weeds, along which the only growth consists of wild oats and other grasses.

"At one or two points, stretches of particularly noxious weed growth have been found, and of these the worst occurred in Monterey County between the towns of Greenfield and Soledad. Here a four-mile section of right of way contained a fairly strong growth of Russian thistle. Mr. J. B. Hickman, Monterey County horticultural commissioner, called attention to this growth and under his supervision the destruction of the weed was attempted by uprooting with hand hoe just before the development of seed had started. This work cost $10.31, or practically $2.50 per mile of highway, the growth consisting of an intermittent fringe along the extreme edge of the right of way. It is too early to comment upon the results of this work but last season the roadway was practically free from the thistle.

"Along some of the highway in San Luis Obispo and Santa Barbara counties a rank growth of mustard is encountered. It is the practice to cut this down while still green, with a horse-drawn mowing machine, and it is estimated that this work is performed for about $1.50 per mile. After cutting, the mustard does not return in the same season, but due to the fact that the weed grows freely and to maturity in numerous fields adjoining the highway, new seed produces a new crop each season."

Mr. J. B. Woodson, headquarters, Fresno, says: "The noxious weeds consist in this division principally of sunflowers, and ground burrs in Kern County, mullen in Merced County, and miscellaneous weeds in the other counties.

"Since the travel is confined more to the center of right of way, where there is a pavement, more effort is required in keeping the right of way clear. Three principal methods have been employed in this division to make the highway more presentable: (1) grader drawn by truck; (2) the grub hoe, and (3) mowing and burning. The latter has been done with team-drawn mowers and with the scythe. The first method is the most effective if done just after the weeds start and often can be done in connection with working the dirt toward the exposed edge of the pavement. More attention will be paid to follow up this method hereafter unless we are advised otherwise.

"The second method (grub hoe) is the most expensive though quite effective. Mowing is the cheapest, after the weeds have gotten a good start, but only gives partial success.

"From July 1, 1915, to January 1, 1916, Maintenance Requisitions No. 162 and No. 216 were issued for this division for the single purpose of keeping down the weeds. These funds were applied on approximately 120 miles and the amount spent amounted to $1,336.42 exclusive of the per cent retained for overhead. This would be approximately $11 per mile

"From January 1, 1916, to the middle of October, 1916, weed cutting was included in the general Maintenance Requisitions No. 363 and No. 493, and the sum used for weed destruction amounted to $1,687.81 applied over 180 miles or approximately a cost of $9.40 per mile.

"In both cases of cost per mile it must be taken into consideration that there are many places where there are no noxious weeds for a long distance."

Mr. W. W. Patch, headquarters, Los Angeles, says: "Weeds have been cut during the seasons of 1915–16 over the following sections in Division VII: L A–2–A, B and C; Ven–2–A, B, C, D, E, F and G; Ora–2–A, B, C and D; S D–2–A, B, C and D, and L A–4–A.

"The approximate average annual cost has been $15 per mile of road. The method employed in this work was to cut as much of right of way as possible with a two-horse mowing machine, following this with scythes and shovels to clean up around guardrails, right of way fences and such points as could not be reached by mowing machines. A crew, consisting of one two-horse team and driver and one laborer, would cut on an average ¾ mile of road (both sides) per day, where conditions were such that the mowing machine could reach most of the right of way.

"The above expense of $15 per mile per year is smaller than would be required to keep the roadway properly free from weeds. We have not spent more than this amount as the funds were not adequate in many cases to take care of the more important features of maintenance and still remove the second crop of weeds."

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical and other publications of a similar nature.

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O. W. Newman——Assistant Secretary State Commission of Horticulture

Entered as second class matter December 29, 1911, at the post office at Sacramento, California, under the act of June 6, 1900.

The Mealybug Question. The recent outbreak of the citrophilus mealybug in Riverside County again brings to the front the proposition of attempted eradication versus control. It is, in my opinion, however, inadvisable to consider attempted eradication seriously in this case until we are certain of the boundary of the infestation, which we are not at the present time. The infested area at Riverside now covers approximately 100 acres, and as inspection continues this area may be considerably enlarged.

To attempt the eradication of any pest without full knowledge of its local distribution is, to say the least, to act prematurely. Eradication means taking severe measures and in this particular case it would mean nothing less than the complete loss of three or four years' crop of fruit. This would be a small price to pay if the treatment could be made effective, but if eradication should be attempted and should fail, then individuals would be made to suffer a severe loss with no compensating gain. The danger of several additional infestations cropping up in the nearby vicinity after eradication has been attempted, is what makes such an effort of doubtful wisdom at this time. If, after a thorough inspection of the district, which will take some time, the mealybug should be found to be limited to a comparatively small area, then eradication is a possibility. The question now arises as to what action had best be taken while this inspection is being carried on. Unquestionably the proper procedure is to adopt the best known means of control in order that the infestation may not spread from the present center. The mealybug has in the past been considered the most difficult citrus pest we have to combat, and control either by spraying or by fumigation has never proven satisfactory and has always been a source of great expense to the industry. It is peculiarly fortunate, then, that Mr. Woglum, of the United States Bureau of Entomology, has apparently demonstrated a method of control which is both effective and cheap. Briefly, his method is as follows (This question is gone into more fully on another page of this Bulletin). He considers that the ants, and particularly the introduced Argentine ant, are responsible for the abundance of the mealybugs for the reason that they keep off the natural enemies. By banding the trees with tanglefoot he has been able to keep the ants from the trees and this gives the natural enemies a chance to get in their work. Mr. Woglum has, during the past year, given some remarkable demonstrations of the efficacy of his method of control in the orchard. He recommends that the Insectary be asked to supply the requisite natural enemies for the work and this we are preparing to do on a large scale by establishing a branch of the State Insectary at Alhambra. If natural control can be made effective against the citrophilus mealybug, as Mr. Woglum has demonstrated it to be against *Pseudococcus citri*, it will go far toward solving the vexing problem which is confronting the citrus growers of Riverside and San Bernardino counties at the present time.

There has been considerable discussion as to where the branch of the State Insectary had best be located, and after considering the matter from every standpoint we have decided that the best results will be accomplished by locating at Alhambra, for the following reasons:

It would not be safe to locate in any section where the citrus mealybug does not occur, since we must work with all species and it would be unwise to take any species into a clean section, even for laboratory work. This would preclude the location in Riverside or San Bernardino counties.

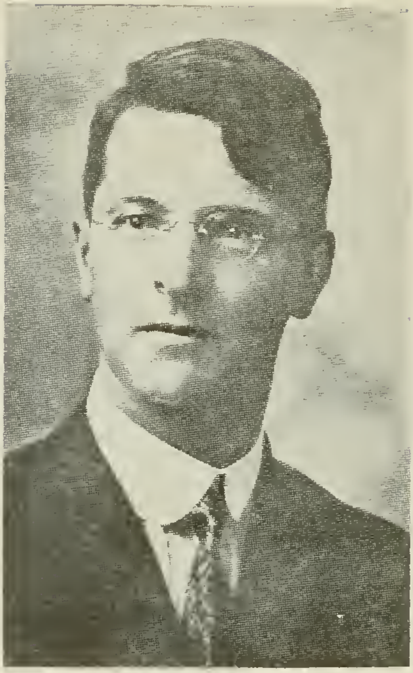
By locating at Alhambra we would have a sufficient supply of the citrus mealybug to draw on for food for the parasites and predators.

Since we must help not only San Bernardino and Riverside counties, but also Los Angeles, Orange, Ventura, Santa Barbara and San Diego as well, Alhambra will be much more convenient from the standpoint of transportation.

We can rear larger quantities of beneficial insects and thus be of more actual benefit to such outlying infested districts as Upland and Riverside, at Alhambra than we could at any other location on account of the great abundance of mealybugs for food.

I believe that this is one of the greatest opportunities we have ever had of serving the citrus industry of the south, and the Superintendent of the Insectary will be sent there to spend the spring months in the thorough organization of the work. At the same time we are asking the legislature for an appropriation for the purpose of supplying other natural enemies of citrus insects from foreign countries.

G. H. H.



A. V. STUBENRAUCH, Deceased.

PROFESSOR A. V. STUBENRAUCH.

In the recent death of Professor A. V. Stubenrauch the state of California has lost one of her foremost citizens. As professor of Pomology in the University of California he labored unceasingly for the benefit of the horticultural industry, and though his work there was of short duration when the hand of death took him, he will long be remembered for his scientific attainment and sterling worth.

To the writer his loss is personally felt because of a close friendship and professional relations extending throughout a considerable period of years. From the time that Professor Stubenrauch was secretary to Dr. Eugene W. Hilgard until his recent death we were thrown in contact with each other as fellow workers with the United States Department of Agriculture and later as members of the International Jury of Awards at the Panama-Pacific Exposition in 1915. His work and character were therefore well known to me, and it was with a feeling of deepest regret that I learned of his death. The University of California, in his passing, has lost a conscientious and capable official whose place can not be easily filled.

G. H. HECKE.

Mediterranean Fruit Fly.—Through the kindness of the Bureau of Entomology, U. S. Dept. of Agriculture, this number of the bulletin contains two splendid colored illustrations of and a very carefully written article on the Mediterranean Fruit Fly. The readers of The Monthly Bulletin who have never seen the work of this insect can better appreciate what its introduction into the state of California would mean. The article being written in such a way as to point out very clearly the dangers to California of the introduction of the pest is extremely valuable, and we wish in this manner to publicly express our appreciation for this valuable addition to our bulletin. Our thanks are, therefore, extended to the Bureau of Entomology, and especially to the writer of the article, Dr. E. A. Back, and to Dr. C. L. Marlatt under whose supervision the work was accomplished. G. H. H.

Cotton Boll Weevil Quarantine.—The amendment to Quarantine Order No. 26, which is published in this number of the bulletin, enables the California cotton growers, or whoever may desire, to import Egyptian cotton seed from the county of Maricopa in Arizona, where this desirable variety of cotton seed is produced. The amendment in no way weakens California's quarantine against the cotton boll weevil, as the pest does not occur in Arizona, and that state is maintaining a quarantine against its entrance into the state. In order that this office may know about every lot of seed imported, and in order that there will be no indiscriminate shipping under the terms of the amendment, the importer must secure a permit from the State Commissioner of Horticulture before he will be allowed to bring such seed into California, and the State Entomologist of Arizona must give a certificate stating the locality where the seed was grown. G. H. H.

GOLDEN ANNIVERSARY

FIFTIETH

CALIFORNIA FRUIT GROWERS' CONVENTION

RIVERSIDE,
June 4, 5, 6, 7, 8, 1917

under the auspices of
the

COMMISSION OF HORTICULTURE
STATE OF CALIFORNIA

The Net Container Act and the Standardization Law.—The Commission has just received a communication from Mr. Charles G. Johnson, State Superintendent of Weights and Measures, which shows very clearly the relationship between the Net Container Act, the Weights and Measure Law and the Standardization Laws. We believe this information should be made public and are sure that a careful study of the following pages will result in a better understanding of the situation:

FEBRUARY 24, 1917.

State Commission of Horticulture,
Forum Building,
Sacramento, California.

GENTLEMEN:

I have for review Assembly Bills Nos. 212, 1110, and 145, calculated to promote the development of the California Fruit Industry, and safeguard the state's reputation in outside markets by establishing standards of quality and quantity, and providing for uniform containers in the packing and marketing of apples and other California fruit products.

My attention is particularly directed to the various provisions of these acts relating to uniform containers, and providing for the indication thereon of a statement of contents. These provisions associate themselves and may be termed "cooperative legislation" with the weights and measures laws, subject to enforcement under the supervision of this department.

The Net Container Act is an act to provide for the indicating of the net quantity of foodstuffs and stuffs intended to be used or prepared for use as food for human beings, when sold or offered or exposed for sale in containers. The act definitely provides that whenever any commodities within the provisions of this act are sold, offered, or exposed for sale in containers, the net weight of the contents of the container shall be plainly and conspicuously marked, branded, or otherwise indicated on the outside or top thereof, or on a label or tag attached thereto.

Any variety of fruit or vegetable when packed in containers is food within the meaning of this act, and consequently any fruit packed in containers must be packed in accordance with the requirement of the provisions thereof.

The law in a general way is calculated to effect the sale of food products by true net weight, yet it provides for liberal exemptions. Section 5 provides that the quantity of the contents may be stated in terms of minimum weight, but in such case the designation must approximate the actual quantity, and there shall be no tolerance below the stated minimum. The act does provide against a tolerance in deficiency, which establishes the opinion that the framers intended to permit a reasonable commercial tolerance in excess, where such tolerance in excess does not defeat the purpose of the act.

Under section 7 the act further provides that it shall not be held to be a violation of the provisions of this act when a commodity in a container is sold or offered or exposed for sale, and there is a discrepancy between the actual quantity of the commodity in said container and the net quantity of the contents thereof indicated on the container, provided that such discrepancy is due to unavoidable leakage, shrinkage, evaporation, waste, or causes beyond the control of the seller acting in good faith.

The Net Container Act can not be construed as providing for uniform containers or the fixing of dimensions calculated to definitely establish a certain size container. It concerns itself entirely with the weight of the commodity. This department in its operation will cooperate to the fullest extent with your department in bringing about uniformity in weight of common commodities.

Under section 6 of the Weights and Measures Act, the state superintendent is given the power to establish standard net weight, or net measure, or net count of any commodity, produce or article. In the exercise of these powers, this department will adjust itself to the effect that any standard weight established will conform to the standard dimensions of any containers as may be fixed by your department.

The Net Container Act of the state of California conforms almost verbatim to the provisions of Food Inspection Decision No. 154 of the Federal Department of

Agriculture, which decision is commonly known as the Federal Net Container Act, and I am of the opinion that in event the state fails in enforcing or would cause to be suspended the provisions of the Net Container Act, that the federal act would be operative and enforced under federal authority.

The statement of contents on containers is calculated to protect purchasers of any commodity against deception as to quantity or amount of commodity purchased, when such commodity is packed in a container. Unless such statement is made, it is impossible for a purchaser to determine the quantity purchased. The indication of contents is essentially in the interest of legitimate competition, and while it offers a substantial safeguard to the purchasing public against deception as to quantity, it provides equally as essential a protection for the packers against commercial misconduct, deception, and fraud.

Since the inception of this department, a most liberal educational policy has been established and maintained, thereby offering to those who are amenable to the requirements of the Net Container Act, convenient opportunity to adjust themselves to such requirements. There appears to be, however, a general lack of concern in the application of this law, which calls for more rigid enforcement. General instructions will be issued by this department at an early date to all weights and measures officials of the state of California, directing their attention to prevent any violation of the Net Container Act. The educational policy will be suspended, and any person violating the provisions of the law will be prosecuted.

This is a good law, prepared and enforced wholly in the interest of legitimate trade and honest competition. Its usefulness, however, is greatly conditioned upon uniform application to all containers of commodities coming within its provisions. Those who are complying with these provisions are entitled to the protection which the law provides for, and they are going to have it.

Sincerely yours,

CHAS. G. JOHNSON,
State Superintendent of Weights and Measures.

COUNTY COMMISSIONERS' DEPARTMENT.

EL DORADO COUNTY POTATOES.

By J. E. Hassler, County Horticultural Commissioner, Placerville.

A year ago a number of small ranchers experimented as to what could be accomplished in a profitable way by the use of certain commercial fertilizers at a rate per acre that would still leave a good profit after deducting first cost of seed, plowing, planting, cultivating, irrigating, cost of water and labor of digging.

It has evidently worked out on a paying basis, as the increased plantings this year would seem to prove conclusively. These small growers are not out a cent for hired labor up to digging time, as they do all their own work. I know one grower in particular who has a fine crop of five acres who has done all the work so far with the help of his little boy.

The cost of the commercial fertilizers used by parties east of Camino will average about $55 per acre, while others up Fruit Ridge have used a great deal less. It will be very interesting to note the difference in yield at digging time of these differently fertilized fields. We have inspected most of these plantings under the certified seed potato law.

The growing of potatoes up in this section now seems to be a sound and profitable financial fact, and no get-rich-quick scheme enters into the calculations of these small growers.

As profits and experience increase and success attends these ventures we may look for a large potato growing district in the very near future. Potato growing here on these lines is in its infancy, and all that is needed now to give it a huge boost is the answer to the question: Will it pay? and this I am sure will be answered emphatically with a yes.

There are probably not less than a thousand or twelve hundred acres in this section preeminently adapted to successful potato culture. The constant and increasing demand for and consumption of potatoes would apparently make the growing of this vegetable in localities where they grow to such perfection as they do in this soil a proposition that would more nearly meet the requirements of the man of small means and would also give quicker and surer returns at a comparatively small cash outlay than fruit growing.

If the growing of potatoes up here will ever assume the proportions, value and importance this crop is surely entitled to, we must standardize our shipments. This growing of the potato for commercial purposes is a matter that should be boosted and helped in every possible way, so that in a few years we should be able to ship out as many carloads of potatoes as we now do of fresh fruit.

I am honestly convinced we can not agitate too much in favor of a movement in this direction. I have learned from my own observations that there is nothing in the county today that offers a more promising or profitable investment than the growing of potatoes.

I want it distinctly understood, however, that when I speak of potato soil I mean the so-called volcanic ash. Other varieties of soil would probably require different formulas of fertilizers in order to get good returns, and this is a matter that can only be worked out through a series of trials and experiments before definite and dependable results could be established.

DEMONSTRATION IN HUMBOLDT COUNTY.

J. F. Benton, the county horticultural commissioner and apple grower of Humboldt County, believes thoroughly in orchard demonstration work and during the past season the up-to-date methods of pruning and spraying were impressed upon the growers through such demonstrations.

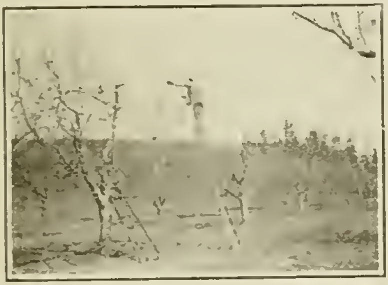


Fig. 27.

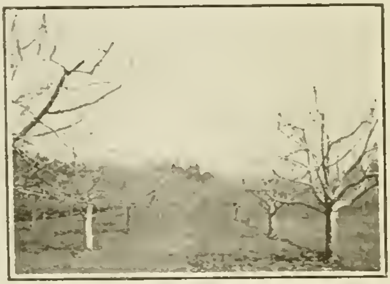


Fig. 28.

Fig. 27. Method of pruning apple trees to keep fruit within reach of the picker.
Fig. 28. Trees after being pruned, thinned and headed to strong laterals, insuring ample strength to carry heavy crop.

The accompanying pictures illustrate the careful manner in which this work was done. The proper attention to pruning, cultivation, spraying, and thinning has resulted in good crops of fruit in Humboldt County as elsewhere, and Mr. Benton states that the two dread diseases of the apple, viz, scab and mildew, were controlled completely by applications of atomic sulphur at intervals of three weeks, at the strength of eight pounds to 50 gallons of water. He also states that "considerable interest was manifested by orchardists from different parts of the country, many traveling as far as 50 miles to see the results of this work."

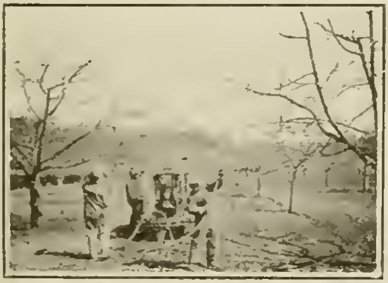


Fig. 29.

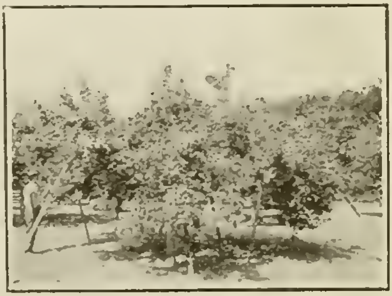


Fig. 30.

Fig. 29. Illustration represents the first spring application for the control of aphis and apple scab. Note the ease with which each portion of the tree is reached when the pruning has been done properly.
Fig. 30. Crop of fruit which is the result of proper pruning, spraying and cultivating.

FROST INJURY TO GRAPES, 1916.

The careful observations of Mr. J. J. Fox, County Horticultural Commissioner, Napa, Cal., upon grapevines following the freeze of 1916, are worthy of special note, as some conclusions relating to the pruning of frozen vines were reached.

Mr. Fox states that "On May 7, 1916, Napa and Sonoma counties were visited by a disastrous freeze which wrought havoc in the vineyards.

"It was an exceedingly promising year, with the heaviest set of fruit on the vines within the memory of the oldest grower, together with a good thrifty growth of cane. In the 7-foot vineyards the vines were meeting. The thermometer registered from 22° to 26° F. on above date.

"After the freeze a great difference of opinion existed among old growers as to what to do with the vines. They faced a problem such as had not been presented since 1885—such a heavy frost at such an advanced stage."

Notes taken in many places under observation throughout the year led Mr. Fox to come to the following conclusions:

(1) "It costs less to sucker after frost injury than to prune the following winter, resulting in better wood and increased vigor to the vine.

(2) "Vines cut and suckered after a freeze have better wood and are in better shape for a crop the next year than those not treated in this manner, although they produced in some instances, less grapes than where left untreated. The grapes were, however, of better quality and matured much earlier. Many second crop grapes did not exceed 14 per cent sugar this year, while those from dormant bud growth were generally normal.

(3) "Either cut frosted vines back to dormant buds or leave alone according to the extent of injury. If cut, follow later with suckering of body and head."

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*Corrected to March 1, 1917.

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Stabler, H. P. --------------Yuba City

TEHAMA.

Commissioner:
Weeks, Chas. B. ------------Red Bluff
Inspector:
Flourney, G. H. ---------------Corning

TULARE.

Commissioner:
Collins, Chas. F.-----------------Visalia
Inspectors:
Baird, W. P. -------------------Dinuba
(Inspects shipments also at Cutler, Seville and Sultana.)
Brann, Frank R. ---------------Lindsay
Clark, Burt ---------------------Goshen
Doyle, C. H. ----------------Porterville
(Inspects shipments also at Strathmore.)
Dungan, J. S. -------------Lemon Cove
Haire, Harry ------------------Angiola
Klindera, F. J. -----------------Tipton
Lawson, J. T. -------------------Tulare
Marr, R. W. ---------------------Pixley
Miller, H. S. ----------------Richgrove
Mitchell, M. ---------------------Ducor
Newhouse, Oliver H. -----------Exeter
(Inspects shipments also at Farmersville.)
Roeder, J. H. -------------Terra Bella
Webb, Steve ----------------Woodlake
Williams, C. H. ------------Springville

VENTURA.

Commissioner:
Brock, A. A. ------------------Ventura
Inspectors:
Call, A. H. ---------------Santa Paula
Essig, S. H. ------------------Ventura
French, J. N. ------------------Oxnard
Willey, J. D. ----------------Moorpark
Wiklund, A. G. ----------------Fillmore

YOLO.

Commissioner:
Gould, Wm. ----------------Woodland
Inspectors:
Bray, James ----------------Dunnigan
Lammie, J. W. -----------------Winters
Morran, J. E. -----------------Rumsey
Murry, Sidney -----------------Esparto
Van Tassel, Harold, PO box 199, Sacramento.

YUBA.

Commissioner:
Harney, G. W. --------------Marysville

WHEN ARE GRAPES RIPE?

By FREDERIC T. BIOLETTI, Department of Viticulture, University of California, Berkeley.

The fruit standardization law of California provides that "Grapes packed for table use shall show a sugar content of not less than 17 per cent Balling's scale, except Emperor, which shall show not less than 16 per cent Balling's scale."

Doubt has been expressed by some as to the reasonableness or advisability of this definition of ripeness. Some investigations of the California Agricultural Experiment Station may throw light on the question.

Since 1914 the changes in composition of grapes during ripening have been observed with numerous varieties in different localities. The changes of most interest in this connection are those in sugar content and in acidity. The sugar content is expressed by the "Balling degree" and the acidity enables us to calculate the Balling acid ratio; that is, the figure obtained by dividing the sugar expressed as Balling degrees by the acidity expressed as grams of tartaric acid in 100 c. c. of juice.

Of particular interest are some results obtained during the shipping season of 1916.

Nearly 400 samples of grapes being packed for shipping were examined at the packing houses. First, each sample was tasted and judged by from four to six persons, and their opinions noted. The samples were arranged as to edibility according to the following scale:

1. Too sour to be eaten.
2. Disagreeably sour.
3. Edible, but too sour.
4. Ripe.
5. Agreeably ripe.
6. Very sweet.

The Balling degree and acidity of each sample was then determined and the results tabulated.

By this means we were able to determine what Balling degree and what Balling acid ratio corresponded to the various degrees of ripeness in the opinions of the tasters. As the tasters were different in each packing house, the averages represent the consensus of opinion of over 300 tasters, which is perhaps as good a measure of the public taste as can easily be obtained.

The legal standard, of course, is not intended to represent the maximum degree of edibility or desirableness, but the minimum—the point below which the consumer would fail to be pleased and therefore cease to be a consumer. This degree is represented in the scale by "3, edible, but too sour." In Table I is given the average "Balling" and "Balling acid ratio" of all samples classed by the judges as: "Edible, but too sour." These averages represent, therefore, the minimum degree of ripeness allowable in the opinion of the judges:

TABLE I.

Composition of Samples Showing Minimum Edibility, Arranged According to Variety.

Total	Variety	Balling	Acid	Balling acid	Number tests
25	Sultanina	15.8	1.12	14.1	6
11	Muscat	16.8	1.20	14.0	3
104	Malaga	16.9	.91	18.6	33
46	Emperor	17.2	.65	26.8	4
24	Black Prince	17.1	1.00	17.4	11
108	Tokay	18.5	1.05	17.6	28
	Averages	17.1	.99	18.1	

The first column gives the total numbers of samples of each variety examined, the last the numbers which were classed as of minimum edibility.

In a general way, these results indicate that the standard of 17 degrees Balling is about right. The lower degree at which the Sultanina was accepted may be due to the fact that this variety was the earliest. Hot weather makes a higher acidity acceptable and the novelty of the first grapes makes the judges less critical.

Converse reasons may account for the higher sugar required for the Tokay.

There is nothing to indicate the advisability of a lower standard for Emperor, but rather a higher, at least in the Balling acid ratio.

TABLE II.

Composition of Samples Showing Minimum Edibility, Arranged According to Locality.
(Vineyard and Packing House Samples, 1914-'15-'16.)

Total	Locality	Balling	Acid	Balling acid
48	Imperial	15.2	.79	19.2
241	Fresno	17.0	.82	20.7
15	Contra Costa County	17.3	1.00	17.2
13	Markets	17.6	.95	18.6
184	Lodi	17.8	.86	20.6
275	Sacramento Valley	18.5	.91	18.9
	Averages	17.2	.89	19.2

Table II includes data on a larger number of samples and varieties than Table I. It includes a number of varieties in the Kearney, Davis, and Imperial collections not included in Table I. The results, however, are confirmatory of those of Table II, which include only the usual varieties and packing house samples.

INSECT PARASITES AND PREDATORS AS ADJUNCTS IN THE CONTROL OF MEALYBUGS.

By HARRY S. SMITH, Superintendent State Insectary.

In recent years the mealybugs have been growing increasingly important as pests of citrus fruits and at the present time they are perhaps attracting more attention than any of the true scale insects attacking the same host plant. There are about twenty different species or kinds of mealybugs in California, but only three occur commonly on citrus. The most numerous of these is what is known as the citrus mealybug, *Pseudococcus citri*, which is found pretty generally distributed over the warmer parts of the state. It feeds on a large number of host plants, although various kinds of citrus seem to be preferred. Clausen states that it was apparently first found in California orchards about 1880, in San Diego County.[1] It was introduced into Ventura County on nursery stock in 1897, and was a serious pest during 1908 and 1909. It is at the present time an important enemy of citrus trees in Los Angeles and San Diego counties.

The Baker mealybug, *Pseudococcus bakeri*, was first described by Essig from Santa Paula, where he found it attacking alder and various deciduous fruit trees. It has since become of some importance as a citrus pest and occurs rather commonly over the citrus growing sections of southern California, as well as at numerous places north of the Tehachapi Mountains. It has a large number of host plants besides citrus.

The citrophilus mealybug, *Pseudococcus citrophilus*, was first found at Upland in a number of citrus groves, and was thought at that time to be the Baker mealybug. It was later found on further study by Clausen to be a new species, which he described under the above name. At the present time its distribution covers several hundred acres of citrus near Upland and one hundred acres near Riverside, and also occurs in Los Angeles County and around San Francisco Bay. Like the other species infesting citrus it has a number of host plants.

All three kinds of mealybugs are quite resistant to fumigation as ordinarily practiced, and this treatment, if made strong enough to kill the pest, results in serious injury to the trees. Some success has been attained by spraying, especially with water under high pressure, but even this method has not always proven satisfactory, because so many applications are necessary that the labor cost is almost prohibitive. On account of the difficulties in the way of combatting these pests artificially, as pointed out above, the natural enemies of mealybugs have attracted much attention. The Insectary has devoted a considerable portion of its time and funds to an attempt to secure new parasites from foreign countries, with a certain measure of success, and to the study of the natural enemies already occurring in California.

This importation and study of the insect enemies of mealybugs has been more than justified, as is proven by the results secured by Mr. Russell S. Woglum, of the U. S. Bureau of Entomology, during the past season. His work may be summarized briefly as follows:

Mr. Woglum has found that with certain exceptions the outbreaks of mealybugs during the past few seasons have been closely connected with infestations of ants, and particularly the introduced Argentine ant. Careful field observations revealed the fact that the ants were not only instrumental in distributing the mealybugs upon the trees and through the orchards, but that they actually protect these by keeping the natural enemies away from the pest. His observations led him to believe that if the ants could be kept from the trees, the insect enemies of the mealybug might be able to keep them down to harmless numbers. A series of experiments were instituted, some on large orchard scale, and it was found that so far as the citrus mealybug was concerned banding the trees with tanglefoot and thus keeping them free from ants was all that was required to control the pest. In fact, Mr. Woglum has given us some remarkable orchard demonstrations of the effectiveness of this method of control, and the importance of his work to the citrus growers of California can not be overestimated.

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[1] Curtis P. Clausen, Mealybugs of Citrus Trees, University of California, Exp. Sta. Bul. 258.

In Mr. Woglum's recommendations it is suggested that the Insectary be asked to supply the requisite natural enemies for placing in the orchard after the trees have been banded and the worst infestations reduced by spraying with water. This we are preparing to do and the laboratory for this purpose will be established at Alhambra during March of the present year. The mealybugs have a large number of insect enemies, some introduced and others native to California, which will be useful in this work. These may be divided into two groups, according to habits: The predators which in the larval and sometimes in the adult stages devour large numbers of the eggs and young mealybugs, and the parasites which destroy their host by depositing an egg within its body, the egg producing a maggot which feeds upon the internal organs finally killing the mealybug and emerging as a winged adult insect ready to begin another generation.

PREDACIOUS INSECTS.

The Brown Lacewing (Sympherobius Californicus Banks).

This insect is generally recognized as the most important natural enemy of the mealybugs and occurs commonly in the mealybug-infested sections of the South. The adult insect is of a grayish-brown color, with markings of a darker shade of brown on the wings. It is slightly over one-half inch in length. The eggs are white in color and are deposited in the vicinity of mealybugs on the leaves and fruit. Clausen states that he has seen the eggs deposited upon the mealybug itself at times and also within the egg masses. The larvæ are extremely voracious and destroy the host insect in large numbers. The adult also feeds upon the smaller mealybugs to some extent. It is a general feeder, and all kinds of mealybugs are subject to its attack. The cocoon is silken, oblong-oval in shape and dirty white or gray in color. It is placed in a protected position, generally under the loose bark and frequently in large clusters. This very beneficial insect would be even more valuable were it not for the fact that it has its own insect enemies which at times become very abundant. Among these are a species of *Pachyneuron*, another Pteromalid, having a long ovipositor, and a parasitic Cynipid. I have not reared *Isodromus iceryæ* from this host, but Clausen and Essig both record it as an important enemy of this valuable predator.

The Brown Lacewing can be reared in confinement, and it should be possible to increase its effectiveness by liberating it in large numbers in infested orchards.

Hyperaspis Lateralis Muls.

This ladybird is found abundantly in the southern part of the state, especially in Los Angeles County. and at times is very effective as an enemy of the citrus mealybug. I have seen trunks of trees almost entirely covered by the cottony pupa cases of this ladybird. The adult is small and black in color, with a number of bright red and yellow markings. The larvæ are entirely covered with cottony wax filaments, so that they resemble mealybugs in a general way. Both the larvæ and the adults feed upon the young mealybugs and eggs. This predator, too, would be very much more valuable if it were not for the fact that it is destroyed in large numbers by *Homalotylus,* an internal parasite. The ladybird is, however, susceptible to rearing in confinement, and it should be possible to increase its numbers in the orchard by this means.

Cryptolæmus Montrouzieri Muls.

This ladybird, which was introduced into California from Australia by Albert Koebele in the early nineties, has been at times a very effective enemy of the citrus mealybug in San Diego and Ventura counties. While it has been repeatedly introduced into the interior by the Insectary, it has never seemed to be able to thrive away from the seacoast. It was introduced into the Hawaiian Islands and has become a very important enemy of mealybugs in that locality. The adult ladybird is comparatively large and black in color, with the head, prothorax and the posterior part of the elytra of a brownish-red color, rendering it very distinct from any other ladybird occurring in California. The eggs are yellow and are deposited among the egg masses of the mealybug. The larvæ are like the preceding species covered with long filaments of a white cottony wax, which render them more or less invisible when occurring in a colony of mealybugs. Their larger size and their different method of movement, however, make them easily seen by the experienced observer. Clausen states that one factor which prevents more effective work on the part of this ladybird is its inability or at least lack of inclination to spread to any extent from tree to tree, or from grove to grove. Since this ladybird can be bred in large numbers in confinement it should not be impossible to overcome this difficulty.

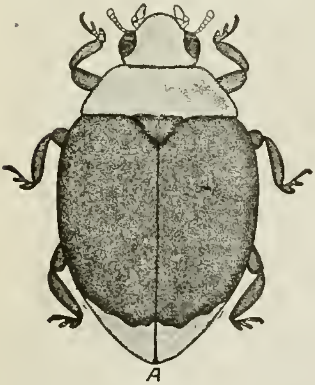

Fig. 31. Adult of the mealybug destroyer, *Cryptolæmus montrouzieri* Muls. Greatly enlarged. (After Essig.)

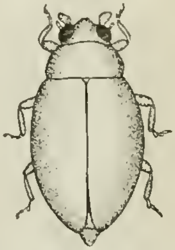

Fig. 32. The small brown ladybird beetle, *Scymnus sordidus* Horn. The illustration is of an adult female, enlarged ten times. (After Essig.)

Scymnus Sordidus Horn.

Several species of the ladybirds belonging to the genus Scymnus are of some importance as enemies of the mealybugs. Perhaps the one most generally found is *Scymnus sordidus*. This ladybird is a very small brownish insect, about one-eighth of an inch in length. Its eggs are deposited in the mealybug colonies and the larvæ are covered with a white cottony wax, very similar to the preceding species of ladybirds. This species is sometimes very effective as an enemy of mealybugs, although its small size places it at a certain disadvantage. The ladybird is found generally distributed throughout the southern part of the state, as well as sometimes in the north, and feeds on various soft-bodied insects, including the aphids.

Scymnus Guttulatus Lec.

Like the preceding, this tiny ladybird becomes at times of considerable importance as an enemy of the citrus mealybug. We have found it especially abundant at Marysville, where it is able occasionally to free the host plants from the pest. The adult beetle is small like the preceding, general ground color dark, mottled with a light brown. The larvæ, like other species of Scymnus, are covered with cottony filaments. The species apparently occurs throughout the entire state, but so far as my observations have gone is most abundant in the Sacramento Valley.

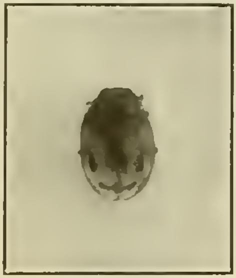

Fig. 33. *Scymnus guttulatus* Lec. An important ladybird enemy of the mealybugs. (Original.)

Scymnus Marginicollis Mann.

This native species occurs throughout the entire state and feeds upon all kinds of scale insects. Since it is not confined to mealybugs its increase upon these insects is not generally very rapid, although in combination with other predators it is of considerable value. The adult beetle is of a dark brown or blackish color, with the prothorax and head brownish-red.

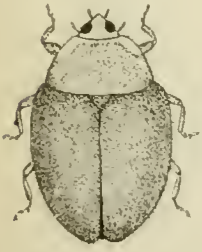

Fig. 35. The margined Scymnus, *Scymnus marginicollis* Mann. Adult female enlarged ten times. (After Essig.)

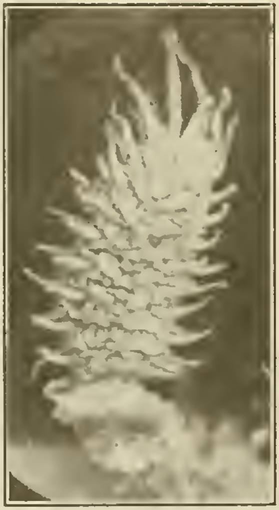

Fig. 34. Larva of *Scymnus guttulatus* in the act of destroying a mealybug. (Original.)

Scymnus Bipunctatus Kugelann.

This ladybird was first introduced into California in 1910 by Mr. George Compere, under the name of *Cryptogonus orbiculus*. It was found by him in the Philippine Islands, and later in the same place by the writer. It is a most effective enemy of mealybugs in its native habitat, and this fact led Mr. Compere and the writer to believe that it would be of great value in California. However, after having been given a thorough trial, it seems to be unable to adapt itself to our conditions to such an extent that it will ever become a practical factor in the control of mealybugs, although it has become established and will probably be able to maintain an existence. The adult is black with a round reddish spot in the center of each elytron. The larvæ resemble those of the other species of Scymnus.

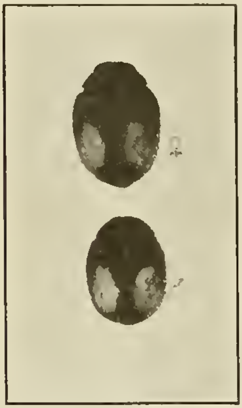
Fig. 36. *Scymnus bipunctatus* Kug. Imported from the Philippines by the Insectary. (Original.)

Rhizobius Ventralis Er.

This valuable beetle, like *Cryptolæmus*, was introduced by Albert Koebele, from Australia, in the early nineties as an enemy of the Black Scale. While the latter insect probably is its most important host, yet it has been found at times to breed abundantly upon the citrus mealybug. The adult beetle is entirely black, and a little less than a quarter of an inch long. The larvæ, too, are almost black in color and sparsely covered with spines or hairs. The beetle can be reared in confinement, but whether or not it can be made of practical value by liberating large numbers in the infested groves remains to be seen.

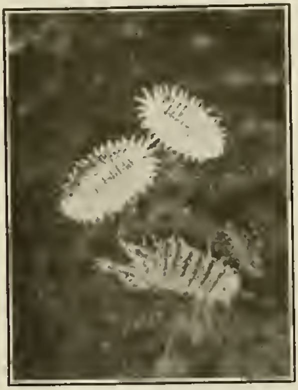
Fig. 37. Larva of *Scymnus bipunctatus* Kug. Showing its close resemblance to mealybugs. (Original.)

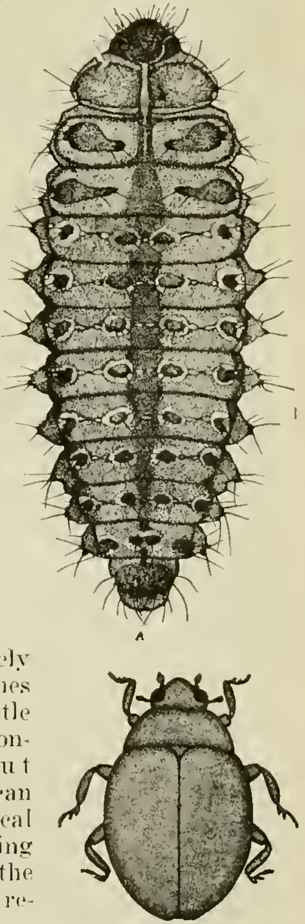

Fig. 38. The black ladybird beetle, *Rhizobius ventralis* Er. Larva and adult greatly enlarged. (After Essig.)

Leucopis Bella Loew.

This small fly is to date by far the most important enemy of the Citrophilus mealybug. During the writer's recent trip to Riverside he found the puparia of this fly in great abundance among the colonies of Citrophilus. The adult fly is of a silvery-gray color with certain distinct black markings. The egg is pure white, oblong-oval in shape, and delicately sculptured with longitudinal ridges. The larvæ are yellowish-brown in color, depending upon the host insect.

They are very effective as enemies of mealybugs, the larvæ feeding upon both the eggs and the younger host insects by sucking the juices therefrom. When the larva is mature it forms a dark brown puparium which is easily observed amongst the egg masses of the mealybugs. This predator will no doubt prove to be of much value in the control of the Citrophilus mealybug, and while it is difficult to breed in confinement it is possible that the growers can be supplied with colonies of this insect by means of collections to be had in other localities. This insect is found throughout the United States and Europe as well.

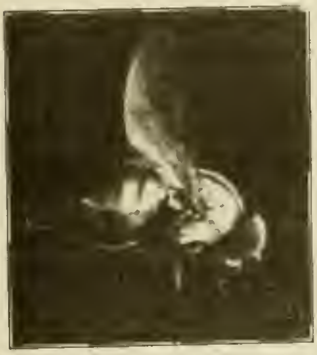

Fig. 39. *Leucopis bella*, a dipterous parasite of the Citrophilus mealybug. Enlarged several times. (Original.)

Baccha Lemur O. S.

This flower fly often becomes of some value as an enemy of the citrus mealybug and the Baker mealybug. The adult is bronzy-black in color, with a wasp-like body and clear transparent wings, each having a black spot near the center. It is slightly over one-half inch in length. The eggs are deposited in a colony of mealybugs and the larvæ feed in much the same way as other syrphids. When full grown the puparium is formed, which is dark brown in color and in shape somewhat resembles a pear. This fly is common in the southern part of the state and at times is of considerable practical importance, although generally speaking it would by no means rank with the preceding fly in practical value.

PARASITIC INSECTS.

Paraleptomastix Abnormis Girault.

This internal parasite was introduced into California from Sicily by the Insectary a couple of years ago. It has been liberated in the citrus orchards throughout the state wherever *P. citri* occurs, and in every instance has become established and is rapidly increasing in numbers. It has already become the most important parasite of the citrus mealybug in California. Mr. Woglum informs me that he has estimated as high as a thousand parasites to the tree in groves near Pasadena.

The adult is a wasp-like insect which deposits its eggs within the young mealybugs by means of an ovipositor or sting. This adult is very characteristic and is easily distinguished from other California parasites by its habit of strutting about on the leaves and fruit, holding its wings aloft. From 35 to 60 days are necessary for a generation, depending upon the weather.

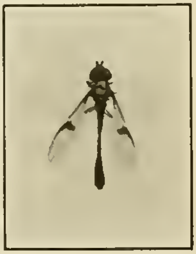

Fig. 40. The lemur syrphid, *Baccha lemur* O. S. Adult, enlarged twice. (After Essig.)

This parasite takes kindly to domestication, in fact the only limit to the quantity that can be reared for liberation is the supply of mealybugs to be had for food. It works on the citrus mealybug only.

Chrysoplatycerus Splendens Howard.

This parasite, as its name indicates, is one of the most beautiful on record. It is small in size and its color is a handsome combination of iridescent blue, green and purple. It is somewhat sluggish in its habits, depositing its eggs in half-grown and larger mealybugs. It occurs in practically all locations in southern California where the citrus mealybug is found, and also in the northern part of the state at Marysville.

This parasite is a native species and was not introduced into California by Mr. Compere, as stated by Clausen and Essig. It was first described by Doctor Howard in 1888, from material forwarded to him from Los Angeles by Albert Koebele in 1886, and has been well known as a parasite of mealybugs for a number of years.

While this parasite is of some value as an adjunct to the other species, taken by itself it would be of little practical importance. It is rather difficult to breed in any numbers in confinement and seems to be confined to *Pseudococcus citri*.

Pseudleptomastix Squamulatus Gir., Epidinocarsis Subalbicornis Gir., Anagyrella Corvina Gir., Pseudaphycus Sp.

These parasites have been bred by the writer in considerable numbers from the grape mealybug in Fresno County. There seems to be some doubt as to whether or not this mealybug is *P. bakeri*, but if it should prove to be the case these parasites might become of value in the work in Southern California. Mr. Clausen reared *Pseudaphycus angelicus* Howard, from *P. citrophilus*. It should be possible to breed this parasite in considerable numbers in confinement for liberation in infested orchards.

There are many minor parasites and predators on mealybugs in California, but it is believed that the above account contains all that are likely to prove of value in their control and that are susceptible of rearing in quantities in confinement. In the final analysis many of these even will be sifted out and the practical work will probably resolve itself into rearing not more than a half dozen species for liberation in the orchards. It is of prime importance, however, to have a number of natural enemies working together in harmony, which attack all the different stages of the host insect, *i. e.*, eggs, young larvæ and full-grown mealybugs.

CROP REPORT AND STATISTICS.

THE ACREAGE OF FRUITS, BEARING AND NONBEARING, BY COUNTIES, IN 1916.

By Geo. P. Weldon.

Accurate figures on the acreage of our fruit trees are in great demand and are exceedingly hard to get. In 1910, when the last census was taken, such figures were included in the data gathered by the census takers. In many cases these figures proved to be quite accurate, but as would naturally be expected, in others they were misleading. However, this source of information on acreage has on the whole been the very best that was available. Another source of information on this subject is the county assessor's office in each county. Here, again, we are able to secure figures that in some cases are very reliable, and in others nothing more than rough estimates. Some of the fruit growers organizations in the state have compiled statistics on the acreage of fruits which they handle. As a general rule these figures have been found quite reliable, but in most cases cover only a small percentage of the total acreage of the state. Such figures have, therefore, only aided in a small degree in the compilation of the comprehensive tables which this office prepared for the years 1914 and 1915. The county horticultural commissioners, of whom there are now forty-seven serving in as many different counties of the state, are the crop reporters for our office. These officials are required by law to make reports to the State Commissioner of Horticulture, and being in the closest possible touch with the fruit industry of their respective counties, the figures which they secure are in the main very reliable. These officials have been urged to exhaust every source of information in a county, as well as to make a careful orchard census wherever such has been possible. In the case of a number of the larger counties of the south, the inspectors in each district have been able to make practically an exact count of the trees so that we do not hesitate in saying that the acreage figures from these counties are by far the most accurate figures available.

It is disappointing to be forced to state again this year that the figures from Fresno and Solano counties have not been revised since 1914. An effort is being made to have the supervisors of Fresno County appropriate sufficient funds and allow the county horticultural commissioner sufficient help to make an orchard survey of the county in the near future, so that in 1917 revised figures may be available. In the case of Solano County there is no horticultural commissioner at present, due to a disinterested board of supervisors and a fruit growing population which have not attempted to force the appointment of such an official. This is an exceedingly unfortunate case of carelessness and neglect on the part of an important fruit county which can not well afford to be without the services of a horticultural commissioner, who should be one of the most valuable officials of a county. The opportunities for aiding the fruit growers in a county like Solano are unlimited, and to invite the unreliable class of nurserymen to unload their undesirable stock in the county; to open the doors of the county to the entrance of pests and diseases that could be detected by inspection, or that are barred by quarantine orders, laws and regulations, is, to say the least, a most short-sighted and narrow-minded policy.

ACREAGE STATISTICS

County	Almonds		Apples		Apricots		Berries		Cherries		Figs		Lem
	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing
Alameda	385	10	130	------	3,905	1,033	138	------	757	34	------	------	10
Butte	3,508	1,218	462	306	34	7	80	------	61	38	75	25	25
Colusa	300	3,500	------	------	30	15	------	------	------	------	20	------	------
Contra Costa	1,860	1,100	160	100	550	320	20	20	220	120	20	8	5
El Dorado	------	------	350	225	------	------	------	------	80	40	------	------	------
Fresno*	------	------	250	30	2,137	613	------	------	------	------	2,919	------	75
Glenn	150	2,380	78	140	200	350	50	------	------	------	------	350	58
Humboldt	------	------	1,500	510	------	------	90	------	------	------	------	------	------
Imperial	------	------	------	------	197	248	50	------	------	------	76	125	17
Kern	30	160	100	2,025	230	245	------	------	------	------	14	97	------
Kings	------	------	------	------	2,118	457	------	------	------	------	------	------	------
Lake	118	329	255	10	31	2	20	------	10	1	10	------	------
Los Angeles	437	64	1,300	720	2,054	1,500	7,764	626	------	------	101	72	4,379
Madera	50	10	200	15	200	50	20	------	------	2	100	315	1
Mendocino	25	------	615	715	30	45	------	------	50	25	20	25	------
Merced	450	1,000	50	25	250	90	50	------	8	7	625	1,315	16
Modoc	------	------	360	235	83	55	50	------	15	------	------	------	------
Monterey	12	------	2,600	------	510	------	120	------	10	------	2	------	------
Napa	170	97	450	172	178	197	65	12	360	165	50	8	22
Nevada	20	------	1,000	269	15	7	60	2	50	4	20	5	------
Orange	------	------	133	225	1,100	200	200	------	------	------	------	------	3,200
Placer	250	116	450	20	45	13	500	------	370	78	------	------	29
Riverside	983	562	904	2,907	3,328	4,823	18	------	44	415	19	12	2,700
Sacramento	1,250	765	425	80	509	70	2,100	------	420	220	10	------	25
San Benito	125	60	325	125	1,500	1,300	600	------	70	10	------	------	------
San Bernardino	1	44	1,492	6,904	1,064	763	68	------	54	130	10	------	2,943
San Diego	85	21	1,110	417	113	267	------	------	8	20	10	16	3,126
San Joaquin	1,200	600	59	30	1,000	------	------	------	1,800	600	80	25	------
San Luis Obispo	214	3,399	308	592	104	363	------	------	2	30	------	------	------
Santa Barbara	------	------	410	140	150	130	------	------	160	130	------	------	910
Santa Clara	258	80	400	443	8,561	457	1,000	------	1,970	2,000	39	21	31
Santa Cruz	------	------	15,800	900	1,300	1,000	500	------	150	250	------	------	15
Shasta	36	------	229	57	10	11	125	10	5	10	7	6	------
Siskiyou	3	1	675	350	10	------	100	------	50	25	------	------	------
Solano*	1,000	415	------	------	1,300	150	------	------	700	300	------	------	------
Sonoma	108	40	5,379	3,136	599	133	1,600	------	714	472	79	------	9
Stanislaus	1,610	1,050	120	7	425	720	120	------	40	30	360	50	8
Sutter	1,500	1,181	157	20	20	------	------	------	42	43	179	------	------
Tehama	500	350	500	50	200	20	------	------	------	------	50	100	------
Tulare	50	250	415	165	425	375	35	35	15	20	625	650	820
Ventura	143	85	------	------	2,171	2,850	------	------	------	------	------	------	3,566
Yolo	3,500	1,100	30	------	1,900	25	200	------	------	------	300	15	------
Yuba	145	65	430	85	100	35	150	60	25	25	1,577	225	25
Totals	20,476	20,052	39,602	22,150	77,977	18,739	15,953	765	8,240	5,244	7,397	3,475	21,946

*1914 figures.

BY COUNTIES.

ons	Olives		Oranges		Peaches		Pears		Plums		Prunes		Walnuts		Totals of counties, exclusive of grapes
Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	
------	11	------	18	------	40	-	450	232	128	15	1,855	585	154	------	9,920
40	1,700	2,160	1,670	113	1,945	210	175	285	35	65	2,530	3,188	25	100	20,060
------	------	------	40	900	300	100	30	20	10	20	1,200	3,500	10	50	10,075
5	143	2	10	5	600	320	850	1,100	80	62	1,100	370	30	1,320	10,180
------	------	------	------	------	300	325	500	1,000	300	550	20	------	20	30	3,710
------	502	------	1,788	------	3,500	------	------	------	343	------	981	------	159	------	13,297
350	45	150	75	2,500	110	2,160	27	580	------	------	210	840	------	150	11,553
------	------	------	------	------	75	30	40	100	------	------	75	------	30	465	2,915
23	52	113	102	165	77	168	57	83	------	------	------	------	------	------	1,583
130	40	860	450	920	660	150	190	1,025	50	120	200	170	5	260	8,731
------	------	369	------	------	7,183	301	------	------	------	------	1,109	375	------	------	11,912
------	55	1	------	------	150	60	500	1,700	------	------	500	600	100	692	5,133
3,744	1,411	201	21,854	9,235	3,102	3,716	550	3,233	785	415	230	227	9,763	6,509	83,995
--	200	800	10	------	1,000	500	15	5	10	45	65	65	1	19	3,727
------	------	------	------	------	150	165	325	950	35	30	450	675	------	------	1,330
10	150	207	45	40	1,600	750	75	33	35	75	20	129	35	85	10,175
------	------	------	------	------	27	20	14	12	20	4	8	2	------	------	905
------	------	------	------	------	100	------	90	------	------	------	40	------	5	------	3,489
22	200	2	23	24	500	80	440	396	100	101	1,000	1,586	180	95	9,708
------	5	------	10	------	850	215	650	1,508	110	258	90	------	20	93	4,761
3,000	169	------	10,110	8,000	75	75	5	20	25	------	------	------	11,850	2,000	40,378
------	320	------	314	16	7,500	352	1,800	800	6,000	700	------	------	------	------	19,641
2,466	1,340	530	16,968	2,876	2,083	1,204	306	600	36	38	466	120	420	1,799	47,957
25	794	780	1,030	730	1,975	915	3,100	1,970	1,435	610	710	850	25	140	20,989
------	------	------	------	------	525	225	250	100	------	------	2,500	1,000	25	65	9,105
2,655	590	729	33,059	8,602	6,231	1,762	130	974	44	48	18	44	504	1,013	69,882
2,071	1,500	81	1,491	149	503	412	118	226	17	83	48	74	116	268	12,580
------	600	300	------	------	7,000	2,000	806	800	500	300	600	700	200	1,000	20,185
------	------	------	------	------	36	114	108	2,110	3	18	192	1,028	313	208	9,442
345	140	105	------	------	5	7	20	------	------	------	------	------	4,800	800	8,552
120	1,500	51	20	12	5,300	200	1,530	223	2,987	153	61,611	1,722	611	259	94,589
------	------	------	1	------	100	50	325	------	------	------	300	------	------	------	20,691
------	140	330	5	4	400	600	100	22	25	260	856	333	37	56	3,674
------	------	------	------	------	180	30	14	15	60	45	20	5	5	15	1,633
20	20	------	10	20	4,200	600	1,000	230	2,521	1,520	4,345	1,800	------	------	20,151
3	650	------	108	16	807	421	1,149	609	107	78	8,905	447	357	293	26,199
3	100	200	120	75	3,846	450	120	90	55	125	75	250	30	520	10,399
------	70	25	------	------	2,572	3,276	221	169	80	3	787	2,011	15	239	12,600
------	------	------	137	219	3,877	700	370	350	100	100	661	558	------	------	8,845
600	1,250	2,760	21,400	21,100	7,850	1,120	65	35	700	240	2,650	3,170	120	200	66,930
2,136	1,207	27	2,661	1,470	------	------	------	------	------	------	------	------	5,067	1,583	23,208
------	450	75	60	15	1,950	100	900	------	600	150	1,450	225	40	10	13,155
10	150	900	160	50	750	350	600	100	300	125	280	375	250	200	6,720
17,773	16,114	12,091	113,729	57,276	82,834	25,137	18,039	22,285	16,436	6,369	101190	30,214	35,384	22,368	798,007

STATE OF CALIFORNIA
COMMISSION OF HORTICULTURE
AMENDMENT NO. 1 TO QUARANTINE ORDER NO. 26.

COTTON BOLL WEEVIL

The following facts have been determined by the State Commissioner of Horticulture, to wit:

The Cotton Boll Weevil (*Anthonomus grandis* Boh.) is not known to exist in the State of Arizona; the State of Arizona has declared and is maintaining a quarantine against the entrance into the State of Arizona of the Cotton Boll Weevil (*Anthonomus grandis* Boh.); and that the best interests of the cotton growers of the State of California require the introduction of Egyptian cotton seed grown in the county of Maricopa, Arizona.

Now, Therefore, it is declared that until further orders Egyptian cotton seed grown in the county of Maricopa, Arizona, may be imported into the State of California subject to the following regulations.

Regulation 1. Persons contemplating the importing or bringing into the State of California cotton seed grown in the county of Maricopa, Arizona, shall first make application to the State Commissioner of Horticulture of California for a permit to so do, stating in the application the name and address of the exporter, the locality where the cotton seed was grown, the amount of the importation, and the name and address of the importer in the State of California to whom the permit should be sent.

Regulation 2. All persons importing or bringing into the State of California, cotton seed grown in the county of Maricopa, Arizona, shall secure in triplicate for each importation of cotton seed a certificate signed by the Entomologist of the State of Arizona, setting forth the locality where the cotton seed, covered by the certificate, was grown. One copy of such certificate is to be filed with the State Commissioner of Horticulture of the State of California, one copy to be delivered to the State Quarantine Guardian before release of shipment of cotton seed to consignee, and one copy to be retained by the importer of the cotton seed.

The foregoing regulations do not apply to the experiments of the United States Department of Agriculture in the State of California.

Quarantine Order No. 26 is amended accordingly.

G. H. HECKE,
State Commissioner of Horticulture.

Approved:
Hiram W. Johnson,
Governor of the State of California.
Issued February 16, 1917.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF JANUARY, 1917.

By Frederick Maskew.

SAN FRANCISCO STATION.

Steamship and Baggage Inspection:

Ships inspected	76
Passengers arriving from fruit fly ports	2,375

Horticultural Imports:

	Parcels
Passed as free from pests	199,485
Fumigated	1,382
Refused admittance	94
Contraband destroyed	18
Total parcels horticultural imports for the month	200,979

PESTS INTERCEPTED.

From Central America:

Aspidiotus cyanophylli and *Selenaspidis articulatus* on bananas.

From China:

Cylas formicarius in sweet potatoes.
Pseudaonidia sp., *Parlatoria* sp., and *Pseudomonas citri* on pomoloes and oranges.

From Hawaii:

Pseudococcus bromeliæ and *Diaspis bromeliæ* on pineapples.
Coccus longulus on betel leaves.
Bruchus sp. in seeds.
Asterolecanium sp., *Coccus hesperidum* and *Chrysomphalus aonidum* on oleander cuttings.

From Japan:

Lepidopterous larvæ in dead wood on persimmon trees.
Pseudococcus sp. on wistaria.
Cicada eggs on persimmon trees.
Cladosporium citri on oranges.
Larvæ of *Bruchus* sp. in chestnuts.
Aulacaspis pentagona on peach.
Hemichionaspis aspidistræ on aspidistra.
Coccid sp. on pear (fruit).
Lepidopterous larvæ in walnuts.

From Java:

Ceroplastes rubens, Lepidosaphes gloverii, Chionaspis citri and *Parlatoria pergandii* on oranges.

From Holland:

Lepidosaphes ulmi on boxwoods.

From Sydney:

Coccid sp. on orchids.
Lepidopterous larvæ on peach trees.

LOS ANGELES STATION.

Steampship and Baggage Inspection:

Ships inspected	34

Horticultural Imports:

	Parcels
Passed as free from pests	97,925
Fumigated	41
Refused admittance	28¼
Contraband destroyed	3¾
Total parcels horticultural imports for the month	97,998

PESTS INTERCEPTED.

From Idaho:

Rhizoctonia on potatoes.

From Japan:

Chrysomphalus ficus and *Hemichionaspis aspidistræ* on aspidistra.
Pseudococcus sp. on azalea.
Pseudococcus sp. on wistaria.
Cicada eggs on wistaria.
Lepidosaphes lasianthi and *Coccus hesperidum* on camellias.

From Mexico:

Lepidopterous larvæ in dates.

From Oregon:

Scab on potatoes.

From Texas:

Dialeurodes citri on Cape jessamine.
Aspidiotus perniciosus on apple trees.

SAN DIEGO STATION.

Steamship and Baggage Inspection:

Ships inspected	18
Fish boats inspected	21
Passengers arriving from fruit fly ports	85

Horticultural Imports:

	Parcels
Passed as free from pests	3,492½
Fumigated	1
Refused admittance	2½
Contraband destroyed	10
Total parcels horticultural imports for the month	3,506

PESTS INTERCEPTED.

From Kansas:

Borers in peach trees.

From Mexico:

Chrysomphalus aurantii on citron.

From Ohio:

Dialeurodes sp. and *Pseudococcus* sp. on ornamental plants.

EUREKA STATION.

Steamship and Baggage Inspection:

Ships inspected	5

Horticultural Imports:

	Parcels
Passed as free from pests	661

PESTS INTERCEPTED.

From Holland:

Lepidosaphes ulmi on boxwoods.
Larvæ of leaf-roller on azalea.

From Japan:

Cecidomyia sp. on daphne.

SANTA BARBARA STATION.

(No report.)

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PREPARE NOW to attend the State Fruit Growers' Convention at Riverside, June 4 – 8. Make it a part of your vacation period. ¶ RIVERSIDE is a beautiful little city. Ample accommodations will be provided. A good program is being formulated. A genuine Southern welcome awaits you.

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1917

VOLUME VI No. 5

THE MONTHLY BULLETIN

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OF

STATE COMMISSION OF HORTICULTURE

SACRAMENTO, CALIFORNIA MAY, 1917

FOREWORD.

The Forty-ninth Fruit Growers Convention held at Napa on November 15, 16 and 17, 1916, was one of the best horticultural meetings of recent years. The program was somewhat unique in that practically every topic dealt with some phase of the marketing problem, and the most competent horticulturists in the state were called upon to take part in the discussions. The University of California, the State Commission Market, the State Viticultural Commission and fruit growers organizations cooperated to the fullest extent, and to these institutions was due in a large measure the success of the convention.

The printing fund for the State Horticultural Commission is not sufficient to provide for the publication of the report of this convention separately, and it has therefore been made a special number of the Monthly Bulletin. Even with this arrangement the strictest economy has been practiced, and most of the discussions following the reading of papers have been eliminated entirely, as well as the invocation, address of welcome, response to address of welcome, opening remarks of each session, etc. The report contains the address of each person scheduled on the program and in addition some very important discussions without which the report would be incomplete.

It is with a sense of deep gratification that this report is given to the public, knowing that it contains information which will have a permanent value in the horticultural literature of the state, and knowing that the series of valuable annual reports since the beginning of California fruit growers conventions has not been broken.

G. H. HECKE,
State Commissioner of Horticulture.

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THE MONTHLY BULLETIN.

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VI. May, 1917. No. 5

Proceedings of Forty-Ninth California State Fruit Growers' Convention

Napa, Cal., November 15, 16, 17, 1916.

THE DRIED PEAR INDUSTRY.

By F. G. STOKES, County Horticultural Commissioner, Kelseyville, Cal.

In discussing a topic allotted to me; viz., "The Dried Pear Industry," my remarks will be somewhat local. The main idea will be to go into detail and show how and why we of Lake County have come into prominence as producers of some of the best dried pears on the market, commanding as I can truthfully state and prove, leading preferential wholesale prices which more than offset our present lack of transportation facilities.

Judging from letters received from prominent dried fruit firms and from their active competition in buying our sun cured pears, we stand in a class by ourselves in raising and drying a first-class Bartlett.

Having made these egotistical remarks boosting this particular feature of the county I represent, and in order to be fair to other parts of the state, producing good Bartletts, will say that Contra Costa, Solano, Sonoma, Napa, Alameda, Santa Clara and Mendocino counties also more or less contribute to the dried pear industry.

The demand for dried pears is certainly on the increase, the markets ever widening and the price with an upward tendency. The question as to whether or not to dry one's pears is generally settled by the price paid for our particular product, there being much variation in the sugary content and texture of the Bartlett, whether irrigated or non-irrigated, and by the ratio of evaporation from ripe fruit to dried. Where Lake County pears dry out from four and five pounds green to one pound dried, in many other localities the ratio is as high as six and seven to one. The higher the ratio, naturally the higher the cost of manufacturing the dried ton for market. Where it costs us, without figuring on wear and tear of plant and interest on investment, from $35 to $40 labor, etc., to turn off each dried ton, in some other places it costs $50 or more, assuming the same scale of wages to be paid; and then, on the side, it might take one or two tons more of the fruit per dried ton. For this reason alone, many counties find it more profitable to sell their pears green to the canner or in nearby cities, or to ship in refrigerator cars to the Eastern markets.

My further remarks may appear simple and are purposely aimed to contain the A B C of the drying process, to aid not those who know, but the growers who do not know how to turn out the best dried pear called for by the consumer. First of all, one must raise good, close-grained pears; good shippers as well as driers; free from blemishes such as scab, thrips marks, frost ring, etc., and of decent size; the larger the better for drying purposes. They should be solid and free from codling moth ravage.

Many pears go into the dry yard affected with the above disfigurements and can be dried but suffer proportionately in their looks and in the ultimate price obtained. To obtain the best and suitable pears one must do good and careful pruning, spraying, cultivating, picking and handling of the fruit. The proper climate in the drying season is a great and important factor. It should be neither too hot nor too cold and the less fog the better. Close attention to detail will result in the best samples of dried pears that can be attained. Many growers spread straw on the ground under the trees, which is especially good on adobe ground, to avoid the bruising of windfalls and pears knocked down in picking. Canvas bags, similar to those used by the orange men, are much better for use in picking than the buckets or baskets, as they allow full freedom for both hands. At least two and more often three pickings are made from the trees. The pear is removed by lifting it up, which breaks it off at the first joint, thus retaining the stem. The pears are emptied from the bottom of the picking bags into large boxes and stacked on a shady side of the tree until loaded on the orchard trucks and hauled for weighing to the dry yard. These trucks or wagons should have springs to prevent unnecessary bruising. After weighing, the pears are usually culled and graded into different grades, and wormy fruit, should there be any, is removed, as such fruit ripens more quickly than the sound. Others cull for size after the pears are partly dry on the trays. The first method certainly saves waste and labor in handling and minimizes loss in box or bin. If well equipped with boxes the pears should be kept in same, stacking them in the order picked, thus preventing confusion and insuring uniformity of ripening. Where boxes are scarce, many store the fruit in straw-bottomed shallow bins, care being taken not to dump pears picked the following days on those picked previously and placing wormy or sunburned pears separate from the sound, thus guarding against rot. If in bins, it is well to cover the fruit with canvas sheets, etc., thereby keeping the temperature more uniform night and day and hastening the ripening process. In a week or ten days the fruit is ready to be cut. It is run out to the cutters in 50-pound lug boxes on small trolleys. Much saving of labor is made by judicious use of these cheap trucks and car tracks which are useful both in the cutting shed and also for running the trays into the sulphur houses or under the balloon hoods and thence out into the drying ground. Ten cents per 50-pound box is the price we pay for cutting pears. We employ the highest grade help, viz, farmers' wives and daughters, matrons and maids from nearby towns, who make substantial sums during the pear season and cheerfully combine pleasure with their profitable work. No neater and comelier maids could be found the wide world over than those whose nimble fingers cut the Lake County pears. Their wages range from $2 to $3.50 a day. The boxes are handed to

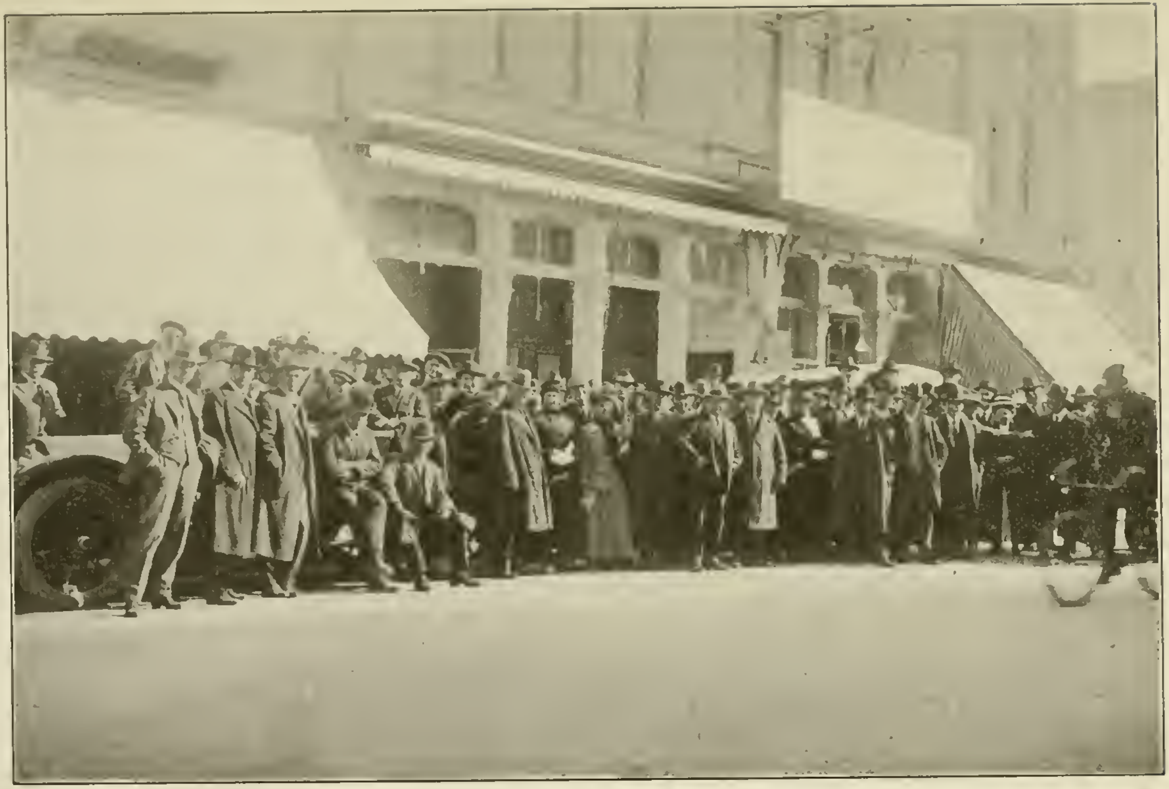

Fig. 41. Some of the fruit growers in attendance at the Forty-ninth Fruit Growers' Convention held at Napa, California, the heart of the beautiful Napa Valley. (Photo by Weldon.)

them by yardmen and the trays packed away by the same. To secure the best results and retain the weight, the pear should not be cut over ripe. The operation consists of halving the fruit with a knife, pulling out the stem and cutting out the calyx with a corer. The core itself is not removed unless the fruit happens to be wormy. Clean milk pans are used to cut the fruit into, and thence it is spread on the trays. Trays are generally made from pine or spruce and measure 8 feet by 3 feet, or 8 feet by 30 inches. They cost about 50 cents each when made of redwood. Such trays discolor the fruit and are not as suitable as those made of pine or spruce. Pickers and yardmen are paid 25 cents an hour and put in ten hours a day in the fruit season. All our help being high-grade whites, we get the maximum amount done in the minimum time. The women and children place the halved pears flat side up and close together, on the trays, which the men stack in the sulphur houses or under the balloon hoods. As each tray is stacked the fruit is well sprinkled with water from hose or water can. For economy of sulphuring and to retain uniform heat during the process, regardless of external changes of weather, the cement sulphur houses are the best, turning out a fancier pear with less consumption of sulphur than in the balloon hood. These hoods are cheap and do well for a small dry yard. They consist of a light wooden framework, covered with two or three-ply roofing paper. By placing these hoods in continuous rows under scaffolding to which is hung a block and tackle on running gear similar to that used for a barn derrick fork, one tackle can do the work of many, raising the hoods in the air while stacking or taking out the trays. When the hoods are down or the sulphur house closed, the sulphur pots are lighted, a small piece of sacking making a good wick. For a balloon hood holding twenty or more trays, a terra cotta makes an ideal receptacle for the sulphur pot, as it can be sunk in the ground outside the hood, the arm of terra cotta laying in a small trench under the trays and the upright serving as the pot container. Lighted and lowered into this by means of a wire hook, a one gallon size Bolton smudge pot makes a good can for the sulphur, a tin lid is then placed almost completely over the terra cotta at the ground surface, the small space being at first left open for draught. Four or five pounds of sulphur is sufficient for a charge for a 22-tray balloon hood and O. K. until 7 a.m. next day, when the charge is renewed again at 6 p.m. About 5 p.m. the second day, or after 48 hours sulphuring, the hoods are raised or the sulphur houses opened, and when the fumes have blown away the trays are unstacked and spread on trestles or the drying ground. Some place them flat on two trestles, others tilt them on one trestle, so that next day the sun will strike the fruit full and even. One whole day is generally the limit of sun exposure. Mr. Tom Renfrow, of the California Fruit Canners Association, advocates one whole day and two nights' exposure. Others expose the fruit to the sun only one-half day. Anyhow the fact remains that long exposure discolors the fruit, and by slight exposure and then stacking until cured, we get our fancy pears. The curing is mostly done in the open, though some have long, cheap sheds as an insurance against rain late in the season. In curing, trays are stacked about twenty high, one inch strips being placed between the trays to insure aeration. Generally they are stacked in a slant, *i. e.,* one end is a foot lighter than the other and the top tray of fruit is covered with a roof tray; the idea of the slant being to shed water in case of rain. To hasten drying it is well to place the stacks lengthwise east and west so the prevailing wind will blow directly on them. It is not well to stack too close and gangways should be left for air circulation and to facilitate handling the fruit. This is light work and is often done by women who sometimes work under a light portable awning. Cover trays are the same size as the others, but the bottom consists of shakes laid roof fashion or else covered with roofing paper. Pears stacked thus in the open are not damaged by rain. In the stack in Lake County the pears dry in from two to four weeks and the same tray can only be used, at most, twice in the season. Some experience is needed in taking the fruit from the trays; if taken off too dry, there is too much loss of weight. We take them off when rubbery but not mushy soft, and place then in clean boxes, stacking in shed so air can circulate. It is surprising how much more they dry from this stage until the end of the season, when they are reboxed and shipped to San Francisco. The orchardist now gets paid spot cash f. o. b. ranch for the dried pears as soon as weighed and loaded for shipment, and our prices this year ranged from 6 cents for culls (*i. e.*, fruit left after the owner shipped the majority of his pears green) to as high as 11½ cents a pound f. o. b. ranch for an entire crop where none were shipped green. Last year one orchard in Big Valley sold $3,509 worth of pears from seven acres, giving the owner a net profit of about $2,725. All of the pears, except the late picking, were dried, or in all five and one-half tons. These sold for 8½ cents a pound f. o. b. ranch, boxed and ready to ship. Even at such high prices as 11½ cents, extra fancy pears are always ready sellers, while the poorer grades are usually a drag in the market.

Regarding the outlook for dried pears, I think that, as many counties with easy shipping facilities favor packing the green Bartlett in preference to drying, and as there are vast fields yet unexplored but available for dried pears, there is no danger of overstocking the market. Judging by this season and last year, and in spite of the European war and the present elimination of Germany (herebefore a heavy buyer of dried pears), we have secured splendid prices; viz., from 6 to 11½ cents per pound f. o. b. ranch. When the European war ends the dried pear industry should surely boom.

DRIED PEARS AND OTHER THINGS.

By **Frank T. Swett**, County Horticultural Commissioner, Martinez, Cal.

After the comprehensive paper of Commissioner Stokes, my only excuse for further talk about pears is to use the pear situation as a peg on which to hang suggestions that may be of use to growers of pears and other dried products.

We cut our pears, bleach them, dry them, some packer comes along and we grudgingly accept the proffered price, our product disappears from our ken, away off somewhere into that undiscovered bourne from which no traveler returns to tell us what eventually became of them. We start the round of another year's production, and spend the money. The pears are gone, and "we should worry."

I want to ask this assembly of growers this question: How many of you use dried pears as a regular article of diet? Have you ever tried them more than once? How many of you really like them? Who knows how to cook them, or is fortunate enough to have a wife who knows how to cook dried fruits? In an audience of 200 people only five raised their hands.

What I am getting at is this: If we in California, where we grow these things, don't know what to do with our own products, how can we expect the great consuming population east of the Rockies to know what we do not know and buy what we do not buy?

Yet somebody, somewhere, buys dried pears to the tune of about 3,000,000 pounds a year, or 1,500 tons a year, corresponding to 7,500 or 10,000 tons of fresh pears per year. The fact is, dried pears are used by Europeans, either in Europe or by those who have come to this country from Germany and Scandinavia.

In spite of its comparatively diminutive size, a business of a quarter of a million of dollars a year is not to be despised, especially as in most cases the smaller and irregular pears and windfalls, fruit which would not otherwise be utilized, is used.

There may be possibilities of increased markets. Maybe our product has enough food value and enough intrinsic merit to warrant some systematic effort to really put it on the map.

Unless markets for dried pears are broadened, some fine day we are likely to wake up to a new situation. Today everybody and his neighbor are busily engaged with cheerful optimism in the hopeful job of creating new pear orchards. Some day thousands of acres of new pear orchards will come into bearing. Does anybody imagine that the markets for fresh and for canned pears can be suddenly doubled without a crash in prices?

Dried pear production is a sort of safety valve. Whenever the pressure on shipping and canning markets becomes excessive, off go a lot of surplus pears, at a low price, to the dry yards. Safety valves are important things.

What is the matter with our dried pear market?

I think it is largely this: Northern Europeans like them, know how to use them, and cheerfully buy them. Americans have not learned.

During the Exposition I asked over 100 Easterners about dried pears. Only one family used them, and they were of German descent.

To make a personal confession, I have been drying pears for twenty years, but until this year we have never made regular use of them on our own ranch and family tables. Most folks who experiment with them quite naturally assume that they should be cooked just like dried apples. The result: Usually a soft, sloppy mess. One trial. Never again.

I have a Spanish friend, somewhat an epicure, quite an artist in edibles. An apron, a cookstove, some simple components, and lo! delightful culinary symphonies, based upon Italian, or French, or Spanish themes, echoes of the sunny Mediterranean. One day he came to me, puzzled. "What is the matter—not any of the grocers of Santa Cruz sell dried pears? Why not?"

He had camped a few weeks at a summer cottage. Among his supplies was a box of dried pears which even the horticultural commissioner of Contra Costa County, to his everlasting humiliation be it said, did not know how to cook, although he grew them. But so deliciously had Mr. Artieda served them to his visiting camp neighbors, five different families of Oaklanders, that after once tasting them they became enthusiastic. They were like the Chinaman of Charles Lamb's tale, who for the first time in history, through the fire that burned his humble cottage, came to learn the virtues of roast pig.

The enthusiasm over the pears was all in vain. They rushed to the local stores to buy the new delicacy. The clerks said, "We don't keep them, there isn't any demand for dried pears." Five California families wanted a California product, and couldn't get it.

Perhaps you would like to know how my friend cooked his pears. It isn't a new recipe, it has probably been in use for hundreds of years.

Wash the fruit clean and simmer for half an hour. By that time the pears will have swollen to almost original size, but will not have softened so as to fall to pieces. If you keep on stewing they will become too soft. Take the pears out; lay them in a shallow dish or pan, strain the water back over them, sprinkle them with sugar, flavor if you wish with spice to taste, and bake fifteen minutes. They will come out of the oven nicely baked, with the sugar crystallized on the surface. Serve with cream and you have a dish that everybody enjoys. Dried pears, according to analysis, are one of the most nutritious of fruits, and at the same price per pound have a greater food value than dried apples.

At the Mechanics' Library in San Francisco there is a whole shelf full of recipe books, big and little. But in none of them was I able to find a single recipe for cooking dried pears, and in fact, very few recipes for the preparation of other dried fruits. The California Fruit Canners distribute two useful little booklets with a variety of good recipes, but mostly for canned fruits and canned vegetables, with just a few dried fruit recipes. The Raisin Association has an excellent collection of raisin recipes. Folders and booklets are good, but somehow, in the clutter of a kitchen they soon get lost or destroyed. They are ephemeral.

How many of you have ever seen a book, neatly bound and printed—"The American Fruit Recipe Book" or "How to Use Our American Fruits, Fresh, Canned and Dried"? This book tells the young housekeeper, tells the hotel chef, teaches even the wise teachers of domestic science about the fruits that are good. It gives the comparative food value per unit of expense, and gives only tested recipes, from the simplest and most frugal to the most elaborate and epicurean; starting with almond and avocado down to prunes and persimmons and the end of the alphabet.

Have none of you seen it? Nobody? Possibly the reason is that it does not yet exist, except in hopeful imagination. It would mean a lot of work by a number of expert specialists. Let us hope, then, that some day, not too far off, there will be such a manual published by the organized fruit industries of California—the orange and the lemon and the almond and peach people, and also let us dream, by the prune and apricot and pear people, who some day may come to the wise conclusion that it is more comfortable and less painful to hang together than to hang separately.

Wouldn't it be worth while? Isn't there a field for such a work? Could a hundred million dollar a year industry afford to do something along this line? I say, advisedly, an American Fruit Recipe Book, and not a California Fruit Recipe Book, for after all, leaving out Thanksgiving cranberries, does not the Western world have to come to California for most of its fruits?

There is another thing we need in California. Better technique, better methods of preparation of many of our fruit products. Our canners, it is true, have wonderfully perfected their methods, in cleanliness, in skill, in selection of material, but there is much to be learned and much to be desired in the selection and handling of our dried fruits. There is a wide field for investigation, trained and scientific, in the preparation of our minor fruit products and by-products, jellies, marmalades, chutneys, fruit pastes, and material for bakers and confectioners.

At the laboratories of the University at Berkeley investigational projects of the utmost value are being carried on vinegars, fruit juices, rice products, jellies and so on, by persistent, skillful, successful workers like Bioletti, Cruess and others. We need all this and we need still more.

I want to make you one definite suggestion, which I trust may result in some action. Let us talk it over with Dean Hunt and President Wheeler and the Regents and see if it is not possible to establish an adequate fruit product laboratory. And if it seems advisable, let us urge that at least a part of the establishment consist of a small but practical working plant at Davis, or some other equally good place, if there be one.

Such a plant should be equipped with evaporators, with dry trays, with sulphur houses, with a small canning plant, with appliances for processing, and should be adequate to test and demonstrate the working theories evolved in the scientific laboratories.

I say Davis, because it is already a center of practical instruction, because it has a practical orchard and vineyard of its own, and because it is the center of the greatest deciduous fruit section of California; because it is near a great olive and a growing citrus region, and is close to the great vegetable fields of the Delta.

It will not be long before the peach and apricot and pear men will be asking that standardized or improved methods of bleaching fruit be worked out. I'm not going to dwell on the subject, but do we not all realize that bleaching fruit is not a standardized process? Some sulphur so heavily and unnecessarily that their product, instead of seeming a gift of heaven, smells more like a donation sent with malice aforethought from the other department of the hereafter.

At present markets demand a light-colored product. How light-colored? Where is the margin that separates sensible, wholesome practice from harmful excess? How many growers agree on the time, or the amount of sulphur to be used for bleaching any given fruit of a given degree of ripeness?

How many growers let fruit lie around for hours after being cut, oxidizing and browning a careless length of time, and then remedy their neglect or ignorance by an overdose of sulphur?

Is it possible that better ways may be devised, so that our use of sulphur may be materially reduced? We don't know, but we ought to find out. Some day we may be compelled to find out. Now the grower, in the rush of harvest, has neither time nor training for the solution of these problems. We must call upon trained experts, and ask for investigations that may take months or years of time.

It would be a complacent mortal indeed who would claim that our present methods are all they should be. The day is not far off when the new orchards so generously and optimistically planted these last few years will be beckoning to us with fruit-laden branches. That fruit must either rot on the ground, or else, starting now, we must pave the way for better products, wiser methods of distribution, and broader markets. We need all the help the state can give us.

And over in the domestic science classes at Davis, and perhaps at many other schools, may we not hope to see the girls learning as part of their education how to make use of our distinctly California products, including our humble dried fruits which some mistaken mortals, through lack of knowledge in themselves or their cooks, now snobbishly look down upon as being hopelessly plebeian.

Don't you think those girls could do some good missionary work?

And now, my friends, leaders in the patient, diligent, farseeing work of upbuilding the greatest industry in the greatest horticultural community of the world, I leave the matter in your hands for action.

WEAKNESSES IN OUR FRESH FRUIT STANDARDIZATION LAW.

By F. B. McKevitt, President California Fruit Distributors, Sacramento, Cal.

I wish to say in the beginning that any expression of opinion I may offer in this paper is my own; I am not speaking for any organization of which I may be a member or an officer, and have consulted no one in regard to some of the recommendations that may be made.

I have been in the fruit business of this state a little over thirty-nine years, and during that time have endeavored to keep my eyes and ears open, studying and thinking of ways and means to improve our methods to the end that both grower and consumer might be benefited. There have been many changes in the fruit business of this state since 1877, and while most of them have been beneficial, they are not all so, and in at least one notable respect, we fail to use the common sense and judgment of years ago.

The present standardization law was not drafted with the idea that it was a perfect law; it was not made hard or drastic, but was intended to be a correction of poor and dishonest packing and compel attention to the principles of common honesty. So far as these things go, it is a success, and with slight modifications would be completely so were it efficiently enforced.

A large percentage of the interstate shipment of fresh fruit is honestly packed; it was so before we had any law bearing upon the subject. Most people recognize the fact that none but good fruit should be shipped, but there are some who can not or will not resist the temptation to increase their shipments by packing unfit fruit. It is because of them that a law is necessary, and its enforcement provided for.

It is a weakness in the present law that domestic shipments are exempt from the provisions of the act. Experience, as well as justice, shows there should be no exemption. This defect will probably be remedied by the present legislature.

In the opinion of many, it is a weakness in the present law that the sugar content of grapes was specified at 17 per cent and Emperors 16 per cent; 18 for most table varieties and 16 for Emperors and Cornichons would be better. Much complaint was made in the Eastern market this season because of green and immature Malagas. Either they were too sour to suit the trade, because of low sugar content, or the inspectors were careless and permitted the shipment of stock that was not up to the standard. Inspection in the same districts last year was satisfactory, and if equally well done this season, would indicate the necessity for a higher standard. It is the poorest of business judgment to ship grapes that are unfit to eat, and nothing will more surely kill the extensively-grown demand for this fruit. It is a weakness that the Standardization Law does not establish a standard pack for interstate shipping, specifying the maximum number of pounds of fruit contained therein. It is necessary to have a provision of this kind owing to the general practice of packing grape crates, apple and pear boxes so full that the covers must be put in place with a press. This is especially detrimental to grapes, as it is almost impossible to do this, without breaking and mashing the fruit. In the case of apples and pears the conditions are almost as bad. The fruit is subjected to so much pressure that nearly every specimen will show a slight bruise, which not only injures its selling value, but if placed in storage will cause decay far more quickly than if the fruit is perfectly sound.

The standard grape crate contains four baskets which are generally known as five-pound baskets and are intended to hold that amount. The crates in which these baskets are placed vary in depth from four to four and one-half inches, and as the baskets are but four inches in depth, it is possible to fill them considerably above the edges, and the practice of doing this has grown until now a cleat eleven-sixteenths of an inch in thickness is nailed to the end of the crate, making the four and one-quarter-inch crate measure a fraction under five inches; this not being enough to satisfy some of the shippers and the trade, two such cleats are often used: not only is the crate so built up, but the fruit is crowded in until it is necessary to "bow" the top in order to get it in place. The result is, that a package intended to comfortably contain twenty-five pounds is made to carry from twenty-eight to thirty pounds and the fruit, instead of being carefully and lightly packed, is crowded into the baskets and the top jammed down upon them, resulting in broken and split berries, with the elements of decay beginning their work of destruction before the package is placed in the car. When a shipper is approached on this subject he will tell you that grapes must be packed in this way because the "trade demand it." Of course, the trade demands it; they would demand a bushel if they thought they could get it. Why should they not do so, if the packer is foolish enough to give it? The retailer seldom sells grapes by the basket, but generally takes the fruit out and sells it by the pound, and if he should sell by the crate, he probably would do as I have seen San Francisco retailers do with berries in small baskets—shake and loosen up the fruit by placing the hand over the basket, inverting it, and then sweeping off all berries above the edge, from which several additional baskets were filled. If all crates contained a maximum amount of, say twenty-five pounds, the dealer would know exactly what he was getting for his money and would buy accordingly, knowing that his competitor was getting no more than he. The fruit is worth so much per pound and should be bought on that basis, which is the only way fair alike to grower and dealer.

This is a subject that is deemed of such vital importance to the industry that an attempt will be made at the present session of the legislature to so amend or to add to the standardization law as to cover this point in such way as to be generally acceptable.

The situation is nearly as bad with apples and pears. I have heretofore written of my experience when acting as one of the jury of awards in the five-box apple contest for the sweepstake prize at the Panama-Pacific Exposition last year. It was found at that time that as high as sixty per cent of the apples in some of the boxes examined had been mechanically bruised; in other words, these beautiful apples, probably the finest grown in the world, produced on the highest-priced land, cultivated regardless of expense; pruned, sprayed and fertilized with utmost care, the fruit picked with gloves, placed in the boxes as carefully as if they were eggs, were over *one-half* injured by overcrowding, and both their appearance and their keeping qualities greatly injured.

Apples and pears should be packed tightly enough to keep them in place. Pressure to secure this should be applied laterally by the operator when packing the fruit. The perpendicular pressure should be applied to corrugated paper fillers placed on the top and bottom of the box, and not directly to the fruit. This would do the work with the least possible loss. As in the case of grapes, it seems good business to advocate the limiting by law of the number of pounds that shall be packed in the box.

We will never secure the best of results from this or any other standardization law until there is a change in our horticultural laws which will give to some central authority complete control over the inspection of fruit instead of the loose method in use at the present time, which permits each county to establish its own standard. The laws also should be so changed as to compel the supervisors of a county to appoint county horticultural commissioners and inspectors when required to do so by the resident taxpayers and horticulturists.

When all is said and done the fact will still remain that true inspection must begin in the orchard. Trees must be properly pruned, ground well cultivated, spraying done as frequently as necessary, and in proper season fruit carefully thinned and picked in suitable condition. This will eliminate small, poor and defective fruit and make it possible to place on each package an inspector's stamp that will mean something.

THE ENFORCEMENT OF THE FRESH FRUIT STANDARDIZATION LAW AS IT APPLIES TO GRAPES.

By Fred P. Roullard, County Horticultural Commissioner, Fresno, Cal.

Since the standardization law went into effect many problems have arisen. The first problem that we met in our work was the problem of getting capable men. It is very important to have capable men to do the inspecting. If poor inspectors are employed much disagreement and trouble will result, not only disagreement and trouble but possibly through the mistakes of the inspectors the commissioner's influence is weakened with the people whom he serves. So immediately I devised a plan of getting my men through examination. It made very little difference about the character of the examination, which was simply something to enable me to get an idea of the people who could be employed in the field to carry on the work.

The method I devised was an examination consisting of something like twenty questions, in two different lists. One list was on the law itself, and the other consisted of ten or twelve questions on fruits, diseases, and pests in general. One member of the State Commission of Horticulture was asked to examine the papers. I wished to allow the fruit companies to get together and select a man of their ranks who would pass on the examination papers, but the appointment of the examiners came too quickly. The method of conducting examination and correcting papers was similar to the methods used in civil service.

Results were entirely satisfactory, enabling me to get good inspectors to whom I possibly owe much of the success attained in this work in Fresno County.

The first thing necessary after appointing the inspectors was their instruction, which was given in night schools and also during the time of the work. For the first three or four weeks of the grape-packing we met every three or four nights in the office and discussed the troubles of the work, endeavoring to bring about greater uniformity, which is of great importance. At the maximum shipping time, one inspector traveled from house to house to standardize the work of inspection; that is, it was his duty to see that inspectors were doing the right thing in a uniform way. He kept close in touch with the packer, shipper, and grower, urging their cooperation in a uniform inspection throughout the campaign. Each inspector was given a route so that no man inspected in one packing shed continuously. This was done to avoid the possibility of an inspector becoming too well acquainted, with the possibility of his becoming subservient to the desires of a packer. The routes were changed on different days, thus further eliminating any tendency to become lax in the work. Automobiles and motorcycles were used in traveling between the various packing houses. The official place of analysis was at the spider which is the place where the ribbons are tied to the boxes of grapes.

During the first part of the campaign a great many questions arose. One possible weakness in the law lies in the fact that the responsibility falls completely upon the shoulders of the county horticultural commissioner, and there is no one higher in authority to say whether certain grapes should be condemned or not. So, in order to get the best judgment on shipments inspected, I would appoint a committee of three or four packers which I felt would use common sense in inspection, and which would not be prejudiced in any way. Grapes for this committee to pass upon were taken to the office or some place in the city, the labels torn off so that no one would know where they were from, and judgment was passed upon them particularly with reference to their shipping qualities. This committee was a great help in determining just what to condemn and what to pass, as it was composed of men of excellent practical judgment. Records of this work are kept in my office. The beginning of the season I required all packers to register. It is very important to have a record of the packers and where they do their packing. Each inspector was supplied with a blank upon which to report to my office. These records are especially important when the grand jury convenes in the fall to find out what you have done and where the money has gone. The amount of the work done in the various counties depends entirely upon the supervisors. Some county boards of supervisors will not hire any inspectors, so that the commissioner is unable to carry out his plans. Other county boards of supervisors will allow the appointment of a few inspectors. In Fresno County the board allowed all the inspectors necessary to carry on the work.

PRACTICAL APPLICATION OF THE CALIFORNIA FRESH FRUIT STANDARDIZATION LAW WITH DECIDUOUS FRUITS.

By H. E. Butler, Penryn, Cal.

The California Fresh Fruit Standardization Law has been in operation a year. Its practical application with deciduous fruits has had its first test.

This law regulates the packing of peaches, plums, pears, cherries, apricots, grapes, cantaloupes, and berries, for export from the state. Its fundamental principles are uniformity of size, quality and maturity throughout the box or package, and the proper marking to correctly designate contents. It was drafted with the idea of creating an honest and dependable pack. Its enforcement is delegated to the County Horticultural Commissioners, who must appoint deputies to act as inspectors.

Fresh deciduous fruit shipments, of the kinds specified in this act, amounted to about 20,000 carloads this year, from shipping points usually grouped into districts as follows:

American River
Placer County
San Joaquin
Vaca Valley
Sacramento River
El Dorado
Shasta
San Jose
Fresno
Visalia
Imperial Valley

During this first year most of these districts were supplied with the necessary equipment for applying the law. Practical tests have been made.

At the outset, it should be known and remembered that practically all of the fresh fruit covered by this law is packed in the orchards by the growers themselves, and seldom in central packing houses, except grapes. It comes from a thousand and one orchard packing sheds, where equipment varies from nil to perfect, and packers from new settlers to experts. In a great many instances packers are the families of the growers themselves.

The chief defects sought to be remedied, and to which, in the application of the law, the inspectors probably paid first attention, are as follows:

First.

Topping. This, in berries, has been nothing short of scandalous in the past, and is a fault most frequently complained of by Eastern buyers, in many kinds of our fruit.

Second.

Irregular size and maturity. Certain trade calls for small sizes, others large, in these fruits, as in oranges. Mixing solid and over-ripe fruit, in the same package, causes much of the heavy wastage the retailers suffer, and enters very largely into their demand for an apparently wide margin of profit.

Third.

Pest infection. This results in condemnation of whole shipments, in states having quarantine laws.

Fourth.

Mixing of varieties. Cheaper kinds in lower layers.

Fifth.

Mismarking and irregularity of marks. This is a complaint from auctions, especially, where plainness and uniformity are very necessary.

Sixth.

Low sugar content.

The law's application to grapes in the San Joaquin is discussed in this convention today by another. Inspection of cantaloupes in the Imperial Valley, under this law, has been in competent hands, and most favorable results are reported. In the largest strawberry shipping section five inspectors worked among the growers and in the shipping houses. Such data as is obtainable indicate excellent results in improved deliveries and satisfaction to the trade, with profitable returns.

In the main tree fruit districts (with one exception) the law has been effectively applied. Inspectors recommended by the horticultural commissioner were appointed for each shipping station, and were paid by county boards of supervisors, as provided in the law. Copies of the statute were printed and distributed among the growers for posting in their orchard packing houses. Growers and shippers have been behind the law, and supported its enforcement. I have never heard a complaint from a grower in our district that the requirements of the law worked any particular hardship on him. Uniformity of size, quality, and maturity have seemed possible to obtain from all packers who are conscientious enough to make an effort to conform.

In practically all instances, shippers have respected the law and refused to load rejected lots. An occasional exception would be where agents were overanxious for tonnage. Every shipping house has, of course, its own receivers, or buyers, as the case may be. The public inspectors have been available to act as referees, between receivers and growers, when occasion required, and, being disinterested, have rendered valuable service. The significance of this is further noted from the fact that this arrangement enables a receiver to be more independent, knowing that the fruit rejected by him, and his rejection confirmed by the public inspector, would not be received by competitors. This feature of the law in operation is probably of more value to the industry than a layman would suspect.

In considering the application of the law and its requirements, there is another factor to be noted: in most of the tree fruit districts equipment for packing in the orchard is exceedingly crude. Why this should be, with so valuable and highly perishable products, is hard to understand. It is a matter worthy of investigation by the Horticultural Department of the state, with the idea of advising improvement. Even with the crudest equipment, however, the system of packing is highly scientific, and the finished product excellent. We have heard Eastern buyers refer to the "marvelously scientific pack of California fruit."

Conforming with the law requires grading for size, quality and maturity. This is very largely done in the orchard packing houses without any special equipment for the purpose. (It should be understood that these comments do not refer to grapes, but to conditions in the tree fruit sections.) The method oftenest used is to stack the peaches, plums, pears, etc., on tables, and to pack from the accumulation, choosing uniform specimens for each box, and handling over and over to find the same. Grading tables, scientifically constructed, can be built, and padded with cloth, for $1.50 each, on which the tenderest fruit may be graded by hand more economically and far better. Such reasonable equipment must be provided when the law's requirements of uniformity are more rigidly enforced.

Maturity has been very largely left by the inspectors to the shippers and growers themselves, that is, with the tree fruits. I doubt if any of the inspectors employed were as competent to judge of this as the handlers themselves. A successful shipper, whether manager of an association, or buyer or dealer, must, and does, know the actual carrying qualities of each and every variety and kind. Also the requirements of the respective markets. These things enter into the criticism of the law, and must be given first consideration.

The practical application of the law this year was not altogether a new thing in some districts. In Placer and El Dorado counties, also in the grape districts, standards for packing were established by voluntary association of shippers and growers, for that purpose, some years ago. Competition among buyers and handlers had bred rank carelessness in packing until shippers and growers were forced together for the protection of the pack. Rules for all varieties and systems of packs were established, and enforced, with immediately favorable results. These rules were made without any regard to whether or not they would stand the test of law. They were the "codification," one might say, of the best styles and systems of packing the various kinds of fruit. Rules for each specific variety were made by a committee of experienced packers. While these rules provided standards which the associated packers and handlers agreed to ship exclusively, they also furnished valuable guides for all growers and packers, especially inexperienced persons, who could learn from the printed rules and diagrams that were posted in the orchard packing houses. Independent inspectors were hired and paid by the shippers and shippers associations. The scheme worked exceedingly well where the shipping concerns cooperated, and refused any pack below the standard. Where cooperation was not close, however, the need of state authority for the inspectors was seen. The present law was largely based on the experiences of these earlier regulations. In the districts mentioned, public sentiment was strongly favorable to regulation, so that when the law went into effect growers and packers were well accustomed to the provisions of the statute.

From the experience thus far gained, it seems unquestionably wise to have state-wide standards for the packing of California fruit. That is, standards of styles and systems. But I believe this can be far better brought about in conventions, and the publishing of specifications and diagrams for the information of all concerned, rather than writing this detail into statutes.

The application of the law, while one season can hardly be claimed as a thorough test, has emphasized what experience with standard rules before had made apparent, the necessity for considering first the limitations of the grower, and of fruit growing, and of packing, under the particular conditions existing in this state, with the production of the kinds of fruit specified in this standard act. Orchards are often widely scattered, frequently miles from the shipping station; roads are rough, and fruit must be packed in the orchard to protect it in the hauling, in a great many cases. It is next to impossible to avail ourselves of a factory pack, such as large central packing houses would afford. The crop is highly perishable, and must be handled quickly or lost. Labor is the grower's biggest item of expense. Expert packers are sometimes impossible to get. The grower's family, neighbors and friends are often utilized to save a crop ripened by a sudden change of weather. Under these circumstances, and others, it would spell disaster for the state to enact arbitrary and critical standards for packing, or for maturity. The broad principle of uniformity of size, quality and maturity is as far as regulation should go with many kinds of fruit specified in this law.

Maturity standards have been, and always will be, difficult to establish. From first to last of the season there is a very long list of varieties of each of the kinds of fruit regulated. Color varies at like maturity in almost every variety of plum and peach particularly. California is a state of many climates and varied soils, and unequal moisture conditions. Intimate knowledge of the characteristics of each variety, and of its peculiarities, under conditions in which produced, are required to determine its real state. Blackberries are red when they are green; some plums are green when they are ripe, while others are still green when red. (So much for the English language.) To fix maturity standards by color is impossible. It was not deemed advisable to attempt it in the deliberations preceding preparation of the present law. (This again refers to the tree fruits and not to grapes, which are entirely different.) Maturity, however, should, in all instances, be within reason. The practical application of any law can be to the extent of reason only. If impossible standards be set, confusion will result. Better and more practical to have no standard law at all than to make standards inconsistent with the profitable and natural pursuit of the industry.

From years of experience in both actual growing of fruit, and in the shipping and marketing of same, and a knowledge of the limitations surrounding the deciduous grower, and of the varied conditions in this state, my chief concern today is the fear of overregulation. I believe the extent of the benefits that will be derived from the present law, if enforced, are very far from being understood as yet, and that any radical changes, thus early in the experiment, would turn the present favorable sentiment among the growers to antagonism, and defeat the end desired, which I believe to be an honest and dependable pack from all sections in California, uniform in size, quality and maturity throughout the box, package or container, correctly marked as to contents, all for the protection of the buyer and consumer, and for the establishment of confidence in California fruit.

THE FUTURE OF THE WINE GRAPE INDUSTRY.

By E. M. SHEEHAN, Secretary State Board of Viticultural Commissioners,
Sacramento, Cal.

My paper, dealing with the subject given me; viz., "The Future of the Wine Grape Industry," is the individual opinion of the writer without regard for his official connection with the State Board of Viticulture or his personal investment in vineyard property or in the making of wine. The conclusions are influenced as a matter of course by the results of elections in recent years on the question of prohibition.

Launching directly into the subject I would say that it is unfortunate for the wine grape interests of California that the industry is linked, not from choice, but, rather, by the influence of its enemies, with all other elements of the liquor business, and it has had to stand or fall under this alliance. To date it has been able to weather the load, and taking its enforced position in the front of the battle line it has saved itself and its weaker allies. By this statement I do not wish to infer that other branches of the liquor traffic are not entitled to consideration, but I do mean to make the positive statement that it is wrong to class the vineyard interests with misconducted retail places and decree that because one element is not managed properly, both should be confiscated.

Unfortunately for the wine grape interests, those demanding radical prohibition have always been permitted to make the issue at elections and have always classed the winery with the saloon. Then, selecting the objectionable class of saloons as the object of attack (after having placed the wineries in that class), the prohibitionists proceed to accuse such saloons of hiding behind the grape industry for salvation.

The issue has not been a fair one and it never will be until such time as the wine grape interests propose their own alliances and proceed to initiate constructive legislation looking toward placing the distribution of wines on a plane that may not excite adverse comment. Indeed, the brewing interests might well join hands with the wine people in a movement in this direction. Until this is done, I believe the wine grape vineyards in California will be in constant jeopardy, and for action no time is so good as the present. I mean by this to encourage the start of an offensive campaign on the part of the wine grape interests having in view the enforcement of strict regulation and changes in the methods of distributing wines and light alcoholic beverages that are really a part of the daily diet of many of the nations of Europe.

There is a much healthier tone to all three branches of viticulture in the state at the present time than there was two years ago. At that time the table grape growers were much depressed on account of poor markets. The wine grape growers were also dissatisfied and the raisin producers were the only ones able to report a stable market.

Last year table and raisin grapes commanded remunerative figures, while the wine grape producers were very much in a rut caused, principally, by the imposition of an exorbitant Federal tax in the making of wine. This year all three branches of the industry appear to be in a flourishing condition. Growers of table grapes have netted excellent returns. The raisin market is firm and promising and the growers of wine grapes are realizing nearly double what they got last year for their grapes. The tax burden has been relieved by legislation in Washington and the wineries all over the state are running well-nigh to capacity.

The market value of the wine grape crop this year will be double what it was last year and the growers of table grapes and raisin grapes have sent thousands of tons of their packing-house culls and second-crop grapes to the wineries for sweet wine purposes. The community of interest among all three branches of viticulture is very aptly illustrated this year, and if the wineries have the capacity it is not likely that any of the culls of the table grape vineyards will fail to find a market.

The State Board of Viticultural Commissioners has been the target for attack by the prohibition press of the state, although, as an official body of the state, it did not engage itself in the controversy. When asked for a statement of facts, it gave them alike to both sides, and yet because of the individual activities of some of its membership in the protection of their own private interests the commission has been accused as a body of a lively participation in affairs at issue. As a matter of cold fact, the Viticultural Commission would have had a perfect right to inject itself officially into the controversy in strict compliance with the statutes creating the commission. It saw fit, however, to answer only questions asked of it, and, in doing so, it has been made to appear by the prohibition press as a proponent of the interests striving to keep California from going dry.

Here it might be stated that a representative board of viticultural commissioners could not be expected to advocate a dry California unless its membership had been brought to the belief that the viticultural industry could not be hurt by prohibition. This would be an absurd conclusion for them to reach, because not only would wine grape vineyards be exterminated, but there would be no salvage at all for the culls of the raisin grape or table grape crops, which, in a number of years, has run as high as 40 per cent of the total production by volume of table grapes and raisin grapes. It would, therefore, be a poor board of viticultural commissioners, charged with the duty of fostering and protecting the grape industry of the state, if it refused to say that prohibition would do no damage to the three branches of grape growing in California. The board has considered the accusations against it so absolutely unfair that it has refused to take official notice of the wild charges that have been made. It does not overlook the fact, either, that up to the present time a majority of the people of California have registered at election times their opposition to prohibition in this state, and it would consider itself ill advised were it to heed the admonitions of the minority.

Aside from the menace of prohibition, the wine grape industry of California has, in my judgment, an excellent future. The very recent Federal legislation has given California an advantage, if availed of, that will operate beneficially in two directions. The recent act of congress reducing the internal revenue tax on wines will probably not be interferred with successfully for a long time. Congress has learned that the subject when placed before it takes up a great deal of time as proven during the past year, and the schedule of tax rates together with the definitions allowing amelioration have been adopted as a compromise between the wine producing sections of the East and the West. Missouri and Ohio wanted the privilege of amelioration of their wines by the use of water and foreign sugar added to their grape juice and they got the privilege to a limited extent under government supervision. In exercising this privilege the wines of these Eastern localities shall be deemed to be wine within the meaning of the Federal law and will be sold as wine qualified by the name of the locality where produced, such as "Ohio wine," "Missouri wine," etc.

The production of California wine requires no amelioration and the advertising possibilities by way of a comparison of the two articles should redound greatly to the advantage of California. On the other hand, I believe the Eastern winemaker will soon see the advantage of making wine out of nothing but grapes, and these grapes must come, of course, from California. Indeed, the movement has already begun and hundreds of cars of wine grapes have left this state during the past two seasons. This movement may assume greater proportions in the future and California may be called upon to plant even a greater area of wine grape vineyards. The transportation charges to Eastern points are too high at the present time, but I believe this matter can be adjusted by the proper showing to the authorities in charge of this particular feature. I might add here that because of the fact that Federal legislation was much belated this season, many inquiries from Eastern manufacturers for California grapes came to naught because the harvest season had too far advanced.

The secret of the inquiry for the grapes of our state lies in the fact that our fruit contains the high sugar and low acid characteristics necessary for blending with Eastern grapes to produce pure wine without any amelioration process.

My estimate at the present moment of the tonnage of grapes that will have been used this season for the making of sweet wine and grape brandy is as follows:

Sweet wines	220,000 tons, producing	17,600,000 gallons
Dry wines	140,000 tons, producing	21,000,000 gallons
Brandy	40,000 tons, producing	1,400,000 gallons

This production, if the estimate proves correct after the season closes, will have netted a sum in excess of $6,000,000 paid to the grape growers of the state by the wineries. Of this amount about $1,000,000 will have been paid for the culls of raisin and table grape vineyards. The production of dry wine would have assumed much greater proportions during the present year if Napa and Sonoma counties had not been so seriously damaged by frost.

In conclusion I wish to say that I take the position of the optimist in relation to the future of the wine industry of California. I do not believe it is going to be destroyed. Its position as an asset of the state ought to prevent its destruction.

THE FUTURE OF THE RAISIN INDUSTRY.

By JAMES MADISON, Manager The California Associated Raisin Company, Fresno, Cal.

Prior to 1912 we produced about 78,000 tons of raisins, and that was about all the market at that time would consume, at a price of $2.45 per hundred, less than 2½ cents per pound. In the year 1913 I took hold of the business of the raisin growers and found there were 36,000 tons of raisins in the state that could not be sold almost at any price. There were hundreds of tons of those raisins sold at 1¼ cents per pound and hard to sell at that. We got control, and started in working toward that which every product of California requires, the pear industry included, and that is to market the goods properly at a reasonable price, control the market, increase consumption by judicious advertising and demonstrate it by special demonstrators.

In 1914 my problem was to keep up the consumption with the production. The good housewife knew how to use raisins and we liberally distributed our recipe books and they sent for them from far and near. In the fall of 1914 we had one day 2700 letters asking for that book. That helped some, perhaps, but the good housewife could not consume the increase in production. So we started in educating the baker to use our Muscat raisins. The bakers had never used Muscat raisins before in their bakeries to any extent at least. We educated them to bake raisin bread. You may not think it amounts to much when you see a small baker turn out half a dozen loaves of raisin bread, but when 100,000,000 people are asking for raisin bread, you can not grow enough raisins in California to provide for them. In 1914 we started that campaign and we sold 7,300 tons. In the year 1915 we sold over 15,000 tons through that same channel. You remember I told you when we started in in 1913 there were 36,000 tons carried over that could not be marketed. We had in 1913 a crop of 75,000 tons. We had a crop in 1914 of 95,000 tons. We had a crop in 1915 of 130,000 tons, and every pound of all those immense crops sold at good prices before the new crop came in this year.

Now, that was not, friends, because everybody spontaneously jumped in and wanted raisins. We have been growing raisins for the last thirty odd years and even when we produced 25,000 or 30,000 tons we could not sell them and get anything for them, as our friends know. In 1914 I bought 1,000 tons of raisins down at Selma at 1¼ cents a pound and lost money on them. Think of it!

Now, I don't want to say that our organization has been altogether the cause of this, but it has been the cause of Mr. Producer's receiving his just share out of this prosperity prevailing throughout the country. The country's prosperity has helped to consume all of our California products at good prices, but the producer, unless the product is somewhat controlled, will not get what is his because the speculator that gets himself posted throughout the world and throughout all the markets is the man that buys and sells, and not the farmer.

Another thing, the way the goods are put on the market has a lot to do with their sale. The packers would buy our goods and would sell them, but they are only merchants. They do the best they can to make an honest dollar for themselves, and you can not blame them, and therefore it is so vitally necessary that industries as large as these are and can be made, should be properly protected, and they can not be protected by law. It can only be done by mutual cooperation.

The raisin industry in 1915 brought into this state over $15,000,000. Our company alone handled over $12,000,000. The maximum of business done through any concern will minimize expenses and make the maximum of profits. Now, is there any way that the raisin grower can get rid of this by-product? The raisin industry is some industry to the state, and I will further say that I would not care how much it increased in a natural way of increase. I believe that we could take care of it and get rid of the product, but if we are forced to have an unnatural increase all in a minute, there is nothing that could stem that tide of destruction. If the by-product of the Tokay grapes and the Malaga shipping grapes and the second-crop Muscat grapes and all the other varieties of the sweet wine grapes is turned into raisins and sold in competition with our good Muscat raisins, all must fail.

In all my arguments I have not referred to the saloon, the whiskey or beer industries in any manner, shape or form. I have worked and fought for the three branches of the viticultural interests, because the three are one and you can not separate them. If we can be protected by law so that we can do business undisturbed we can invite our Eastern friends, as we have done, to come here and raise raisin and wine grapes. I am fighting for the raisin industry and I want to develop it in the future.

You can plant your hills and your valleys to raisin grapes as long as it is done gradually, as long as our advertising and salesmanship and educational work will keep this 100,000,000 people chewing up raisins. I believe that I can be prophet enough to say that the product can be marketed at good, fair prices, but you must remember the by-product, which endangers the industry. I can take your Tokay culls and your Malaga culls and all your other trash and make Valencias out of them in ten hours from the green grape and put them on the market for anything I can get because they are a by-product. We are very soon going to be overloaded with inferior material. The rain that came this year will hurt us. It destroyed a part of our crop and hurt the quality of all. Over all the United States and the whole of Europe today, people believe we are raising a fine quality of raisin.

We have, as you know, most of you, I presume, three kinds of raisins: the Muscat, which is the largest in volume. It weighed something over 90,000 tons last year. We had about 22,000 or 23,000 tons of Thompson Seedless, and our crop of Sultanas weighed 6,000 or 7,000 tons.

I would warn the producers, who have gone crazy on the planting of Thompson Seedless grapes because, for the last year or two prices have been higher on account of the unforeseen conditions in Europe. I would warn the state not to continue planting Thompson Seedless, because the minute the war is over in Europe the Greek currants and the Smyrna seedless can be sold in New York for half the money you get for your raisins in California; and the minute that condition exists your prices will automatically go down or you can not sell your product at all. I am only desirous of warning you because I see it. We will within the next few years—I would say three years—produce twice as many Thompson Seedless as we produce today. There have been thousands and thousands of acres planted to that variety within the last four or five years and they are all coming into bearing. Even with the loss from the rain this year we will exceed our last year's production by 20 or 25 per cent and it will increase more rapidly within the next two or three years. Therefore, it seems to me that this may be the proper place to throw out that warning to the producers of the state. I would recommend today, if you are going to plant a vineyard, to plant Muscats and Sultanas. I believe the Sultana would be the most profitable wherever the soil conditions are satisfactory.

ORGANIZATION FOR CALIFORNIA PRUNE AND APRICOT GROWERS.

By Geo. E. Merrill, San Jose, Cal.

It is no doubt true that we are rapidly passing from the age of individualism to that of collectivism. Collectivism is impossible without organization. Farmers, because of their environment and training, are about the last group to perceive the advantages of collective action, but no class of farmers in the United States, at least, has made better progress in cooperation than the fruit growers of California. The citrus fruit producers, the almond growers, the raisin growers all have records of long years of successful cooperation in the marketing of the fruits of their toil, and the success of the peach, walnut and olive growers' associations bids fair to be as great as that of their older brothers. Of all the fruits extensively grown in California, prunes and apricots alone have no state-wide marketing association. During the past twenty years there have been many attempts, of varying degrees of success, to form comprehensive marketing associations for these fruits. I say of varying degrees of success advisedly, because not one of these attempts, however miserably it may have seemed to fail, but has done its part towards paving the way for the present organization, which we believe is so planned and begun that its success must be assured. My purpose in this paper is to give a brief outline of the genesis of the movement; a short discussion of the agreements by which the growers are organizing, and a few thoughts regarding the reasons for and the benefits of the organization.

Early in the season of 1915 some wide-awake prune and apricot growers living at Cupertino, in Santa Clara County, discovered that speculative packing interests had sold short in the East at low prices a large proportion, 35 per cent perhaps, of the 1915 prune crop. Many short sales had been consummated while the prunes were still in the blossom, and when no one had any intelligent idea of how large the crop would be. The progressive growers who had informed themselves of these conditions realized that if their knowledge could be disseminated and the growers as a whole or any large proportion of them could be induced to hold their crops until they knew whether the conditions involved justified the low price named in the early sales contracts, that they would have taken the first step toward securing what their goods were worth. At the instance of these far-sighted producers, a mass meeting was held in San Jose at which the situation was laid before the growers assembled, who then and there delegated to a duly authorized committee the task of acquiring prune and apricot market and crop information and disseminating the knowledge thus acquired among the prune and apricot growers of California.

1915 COMMITTEE.

The committee, which has since become known as the 1915 Fruitgrowers Committee, held meetings at regular intervals throughout the summer and fall, and at these meetings exchanged information among its members and prepared reports which were published in the San Jose Mercury and in the agricultural press of the state. Early in the course of its activities, the committee became convinced that the crop was shorter and the market conditions better than the speculative interests had led the public to believe and that, in view of the circumstances involved, much higher prices were justified than those named in the early sales contracts. The committee therefore used every means in its power to induce the growers to hold for better prices. To the credit of the growers, be it said, the committee's advice was well accepted by a large number of them in the Santa Clara Valley and elsewhere, but it was not taken by many other growers for the simple reason that they did not know of it, as the committee had only limited avenues of publicity at its command. Although the activities of the committee were a factor in the 1915 market and did much towards raising and maintaining prune prices, the members of the committee realized that a more complete success was not obtained because their organization was not sufficiently complete and comprehensive.

GROWERS INFORMATION BUREAU.

With this idea in mind, the 1915 committee prepared the plan for the formation of the Growers Information Bureau which came into being at a representative mass meeting of prune and apricot growers held in San Jose on January 19, 1916. This meeting was well attended by Santa Clara Valley growers and there were representatives present from nearly every other prune and apricot growing section of California.

The organizers of the information bureau intended eventually to form a selling agency for prune and apricot growers, but were of the opinion that at least a year's time should be devoted to the acquiring of an accurate knowledge of the conditions involved. They believed that the chief public work of the information bureau for the present season should consist in the dissemination of such information among the prune and apricot growers as would enable them to receive fair prices for their products. But events do not always eventuate as scheduled, and before the information bureau was able to complete its own organization, the prune and apricot growers from certain sections became so insistent in their demand for the immediate formation of a selling organization, that the promotion of the information bureau became interested in this question. Under these circumstances it became the duty of the information bureau to prepare a plan for a

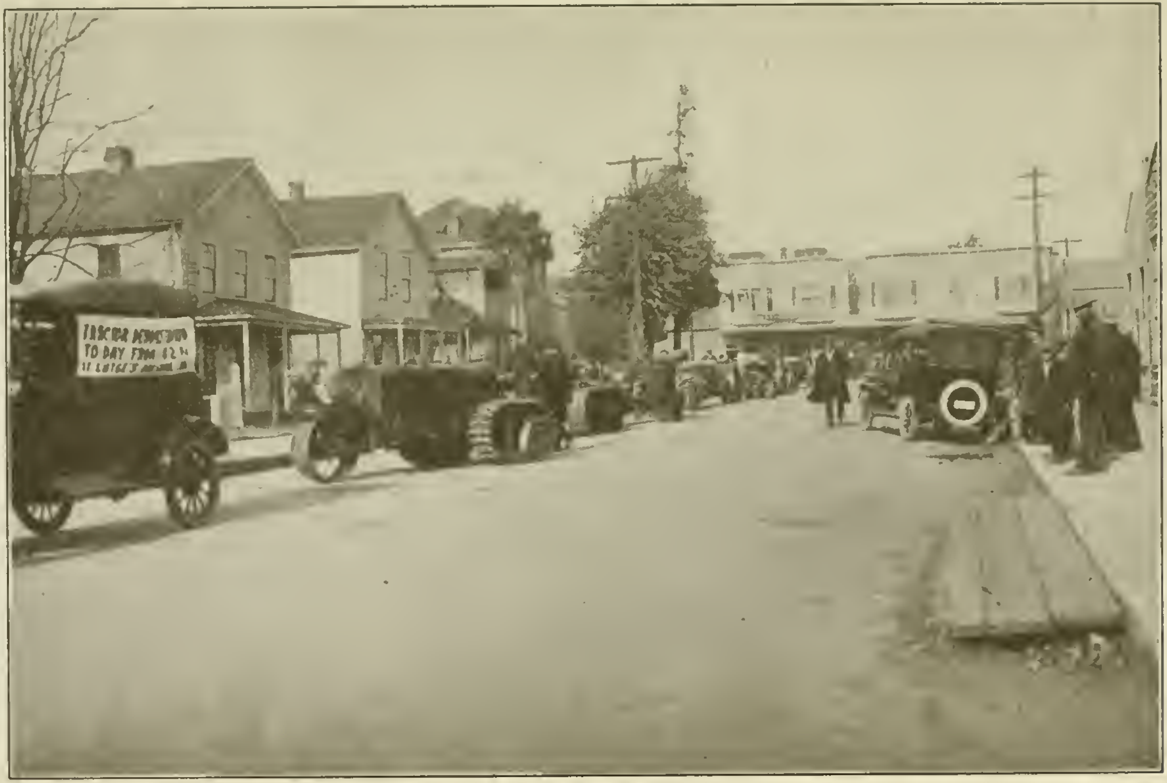
TRACTOR DEMONSTRATION
TO DAY FROM

Fig 42. Parade of tractors at the Forty-ninth Fruit Growers' Convention. The tractor demonstration was one of the drawing cards of the Convention and proved of great value. (Photo by Weldon.)

state-wide selling agency for prune and apricot growers. In the preparation of this plan the methods of the successful growers' organizations already in operation in California were studied and an effort was made to devise for the prune and apricot growers a plan of organization that would be particularly adapted for their requirements. In the preparation of the plan, large and small growers were freely consulted and their suggestions and criticisms met and adopted as far as possible. The experience and advice of the Associated Raisin Company, The Farmers' Union and other cooperative organizations were freely drawn upon. Free use was made of the facilities offered by the State Market Director's office. It may also be of interest to our packing friends to assure them that several packers of wide experience were given an opportunity to peruse and criticize the proposed contracts. Since its perfection the plan has been widely endorsed by the Farmers' Educational and Cooperative Union, by the Grange, by agricultural newspapers, by chambers of commerce, by bankers, business men and public officials.

CONTRACTS.

It is not my purpose at this time to discuss in detail the various provisions of the contracts, but a brief resume of their salient features will not be out of place. In brief, the organization contemplated is that of the formation of a corporation under the laws of California. The corporation is to be capitalized at $2,500,000 divided into 25,000 shares of a par value of $100 each. Ten thousand shares will be preferred stock which can be used only for certain well defined purposes, chief among which is the acquiring of packing plants. Fifteen thousand shares will be common stock, which will be taken largely by the growers. Growers are asked to subscribe to the common stock at the rate of $10 per acre for each acre of bearing prunes or apricots owned by them. This stock may be paid for in four equal payments of 25 per cent each. The first payment is due on call when all the conditions called for in the subscription and voting agreement have been complied with. The second payment is due ten months after the call for the first and the remaining two payments at yearly intervals thereafter. The organization expenses are met by funds raised by the San Jose business men and commercial organizations, and by payments from growers, who are asked to contribute 5 per cent of their subscription when signing, with the understanding that this 5 per cent will later be deducted from their first regular payment for the stock.

The formation of the corporation and the election of its directors are entrusted to a board of 25 trustees, each one of whom must be a bona fide prune or apricot grower. Twenty-four members of this board are elected by the subscribers to the first $500,000 worth of stock subscribed for. The manner in which the trustees are elected is very carefully defined in the subscription and voting trust agreement.

In addition to the formation of the corporation, the trustees are authorized to vote all of the common stock as a unit at each meeting of the stockholders during the term for which they are chosen. The trustees thus have the authority to choose and remove the directors. Through the operation of the board of trustees, the rights of the small stockholder will be protected; large and small stockholders thus are members of the company upon an absolutely equitable basis. The duties and powers of the trustees are very carefully defined in the subscription and voting trust agreement.

Growers who subscribe for stock also agree to sign over their fruit to the association for a term of three years with option of renewal for two years more, according to the terms of the contract attached to the subscription and voting trust agreement. Growers who sign this agreement are not bound for anything more than organization expenses, unless by March 1, 1917, contracts are executed covering at least 75 per cent of the prunes and apricots grown in California and unless at least $750,000 worth of stock has been placed by that date. It is made plain that failure to secure 75 per cent of the apricots, for example, will not prevent the association from operating with the prunes, should 75 per cent of the prunes be obtained. Just what constitutes 75 per cent of the acreage is left for the board of trustees to determine, but every effort is being made by the information bureau and the organization committee to ascertain accurately the acreage of every bearing prune and apricot orchard in California.

The fruit contract which the growers will sign provides, in the case of prunes, for a payment of a 4-cent basis on delivery to the association. At least half of this 4-cent basis must be paid in gold coin, the balance may be paid in interest-bearing notes, payable in three or six months. These notes ought always to be readily negotiable and there is no good reason why, with business conditions ordinarily good and a crop of normal size, the full 4-cent basis should not be paid in cash on delivery. The apricot contract will provide for the payment of 8 cents per pound for apricots of a quality equivalent to one-third each of the grades, choice, extrachoice and fancy, payable on the same terms as the 4-cent advance for prunes. Both these contract prices may be reduced by a four-fifths vote of the board of trustees. This provision introduces an element of elasticity into the workings of the proposed association and ought to make it a much more attractive business venture, as through its operation the price can be made to follow the general market trend. The history of past unsuccessful cooperative organizations shows that they frequently failed because of the arbitrary setting of a price too high for the disposal of their crops under the conditions involved, which are sometimes the reverse of ideal.

In addition to the advance payments on delivery, the association agrees to use its best efforts to resell the fruit of its members at higher prices and to return to them all it receives, except 5 per cent reserved for the cost of doing business. With reasonably good management, the 5 per cent together with the packing profits will supply a liberal advertising fund, meet all overhead charges and pay a fair dividend on both preferred and common stock.

BENEFITS.

In addition to the many indirect benefits that will result from the formation of the association, it will eliminate speculation; it will make possible the standardization of the pack and finally it will result in a general raising of the price level for both prunes and apricots through the development of an improved form of package and the popularization of that package through national advertising.

For the five years ending 1914, the people of the United States ate less than one-half as many prunes and apricots as they did in the five years ending 1902. Why did this decrease in domestic consumption take place? Largely because the people were not invited to eat these desirable fruit products. During the same period of years, the consumption of other fruits, notably breakfast foods and citrus fruits, increased remarkably because of effective advertising. The people ate oranges and grapenuts for breakfast instead of oatmeal and stewed prunes. Had it not been for the exploitation of the foreign markets, the plight of the California prune and apricot growers would indeed have been a sad one.

WHAT OF THE FUTURE?

It is true that during the past two years the domestic market conditions have improved and our people are eating more dried fruit, and even with no well-directed, sympathetic exploitation of the market, prunes and apricots have moved off at fair prices. But what would prunes and apricots have been worth during the past three years had our orchards come through with good crops? What will our products be worth next year if we have a 125,000-ton crop of prunes and a 25,000-ton crop of apricots with poor business conditions and no organization? Crops of that size impossible, you say. Not at all! Next year we shall have more prunes and apricots in bearing than ever before and our orchards will be better cared for than ever, and with good growing conditions, crops of that size next year are highly probable. What of the more distant future, which after all is only a few years ahead, when California will have 150,000 acres of prunes in bearing and 60,000 acres of apricots?

What of that future when Europe shall have completed her debauch, but when she will still be suffering from its effects even more than at present? What of that future when business conditions the world over are the reverse of what they are today? How can we growers afford not to prepare for the future? What other way of preparation is open to us than through the formation of a marketing agency along lines tried and proved effective?

THE FUTURE OF THE PRUNE INDUSTRY; WHAT SHALL WE MAKE IT?

By H. C. Dunlap, Napa, Cal.

We are confronted with an undeveloped market, abandoned to wasteful and unsound speculative conditions. We will in the very near future undoubtedly be called on to market many times our present production.

Shall we prepare a market by standardizing our goods, advertising them, and by establishing a control of this market to foster and protect the industry and encourage the consumption? Or, on the other hand, shall we calmly stand by and see our prosperity go glimmering because we have not the moral courage and confidence in human nature to adopt and apply modern business methods?

The history of many industries proves what the future will be if we do not prepare. The present of many similar industries proves what can be accomplished if we combat and overcome the conditions we face.

The most intelligent and practical business men in our nation have applied cooperative methods to foster and protect their interests. Many rural industries have established stable and enduring prosperity for themselves and their communities by application of similar methods.

The many good business and legal authorities in our state and in our county, who have advised and consulted with regard to the terms and principles embodied in the agreements we are asked to sign, unanimously endorse the plan and urge us to participate. They see in our cooperation the certainty of a greater assured prosperity for our already prosperous and productive state.

We have now the opportunity to accomplish for ourselves and our communities this great work. I defy any man, grower, packer, business man, or whatever, the speculator only excepted, to show me where his interest will not be furthered by this move. And I want to add that it is certainly the duty of every grower in this state to make this investment.

This cooperation will be our cooperation and any provision that will make for its success will make for the success of our individual interests in it, and in our crops. The men who will be called on to execute this great work must be given a good business proposition to work on, otherwise the producers' interests will never be preserved.

In view of the present unsound conditions existing in our market, and the great production we must shortly dispose of, every grower can afford to make the required investment and every business man can afford to help, because they can not afford to let this opportunity to insure the future slip by.

I have been slated on the program to assist in the discussion, and not wishing to encroach on any one's time, I will close with a report of the progress so far made by our Napa County growers' organization committee. After a week or two spent in interesting our business men, bankers and progressive urbanites, and circulating educational literature, and canvassing to secure an attendance for a mass meeting we have for several days past canvassed the county to secure the signatures and contributions of our growers. I would say that we have been very successful. We have found but three growers so far who absolutely refuse to cooperate. We have found all others interested and anxious, either to sign up or to get further information before taking the step. We have appealed to all growers the last day or two to sign up in order that we might be able to report progress here today to our company from all over the state and help to stimulate the interest of growers from other communities in this work. I am happy to report that we have many growers who were willing to make a hurry-up job of it in order that we might shine before this company.

Mr. Merrill has informed you that there is at present a movement on foot to organize the prune and apricot industries of California. He has outlined in general, and more or less in particular, just what is proposed, namely, that the growers form a corporation, subscribe to stock and organize in such wise as to develop and control for their own best interests the market conditions attending the distribution of our dried prunes and apricots.

The question first arises, why should this be necessary? I will tell you the one great reason why this is absolutely necessary. All the undesirable features in our market are the result of the existence of an undesirable element, the speculative element that attends every transaction. The gambling feature breeds the other undesirables. It throttles consumption because the dealers suppress the trade in a commodity when they risk great losses and push a product in the handling of which they are assured reasonable profits.

No one can afford to advertise a product of which he can only deliver a small portion, and that without any assurance of profit. Lacking standardization, inferior stuff is sometimes delivered to the consumer when he had reason to expect excellence. In view of the price the consumer now pays for cured prunes and apricots, the producer should receive greater returns than have prevailed of late.

Eventually the producer and consumer must pay for all the losses and all the profits accruing to those who, of necessity or otherwise, speculate on the distribution. A consumer is gambling today when he acquires a taste for our fruit. The demand thus created may cause such an increase in price as to spoil his taste.

It is not only the high price the producer has received that is accountable for the failing consumption of our products, it is the dreadful waste due to the fact that every transaction connected with the distribution is speculative, and the consumer has had to pay the greater portion of the bill lately.

Considering these features of our present market, what are we going to do with the increased production from forty thousand acres of young orchard now planted in this state? What generally happens when the demand decreases and the supply increases? What will we get for a 250,000,000-pound crop, even when your foreign markets are again available?

A cooperative organization of growers could advertise our products and develop a greater demand. An advertising campaign to educate the consumer and bring to his attention the excellence and desirability of our fruits in many forms, would undoubtedly get wonderful results. A growers' organization could bring about a standardization of our products calculated to meet all the demand for excellence in all the grades, insuring the delivery of reasonable values to meet the consumer's requirements.

A growers' organization controlling a large percentage of the production of California prunes or apricots could also stabilize prices. It could establish prices each year reasonable in view of the supply and demand; reasonable for the grower and, having its own advertised pack on the market, reasonable for the consumer. Between these two prices packers, dealers, brokers and others would have to figure their profits in reasonable assured percentages. They would become as manufacturers, dealers and brokers, dealing in commodities in the handling of which they are assured reasonable interest on their investments. The only interests in our industry that will not be improved by the stabilizing influence of this organization will be the gambling interests. Since these interests are the only undesirables in our market today, our results will be the consummation of our hopes.

With regard to the foundation on which we hope to build, namely, the agreements we are asked to sign, many questions naturally arise. In general, I wish to say that these agreements were compiled after the plan that has made for the increasingly successful operation of the raisin association, and the wonderful start of the peach growers this year. Cooperative organizations of citrus, almond, walnut and bean growers have been great successes in this state. Cooperative organizations of producers all over the world are the foundation of the most prosperous communities today. The agreements we are asked to sign are endorsed by all the good business and legal authorities who have been consulted and advised with regard to their specific features. Profiting by the experience acquired from past failures and given the working examples of all the present successes, we have the very best reasons in the world to expect wonderful results.

Every grower should sign these agreements. It is his duty to himself and his property, the value of which he wishes to maintain and secure. It is his duty to his neighbor and the whole community. If he can not, or does not pay his taxes, his insurance, or his bills, he risks his property. If he does not sign and contribute to the proposed growers' organization he takes the same risks.

Growers, if you would economize with your own money and time, sign up at the first opportunity. Your organizers deserve encouragement. They desire to save your money for your future needs. The sooner you can get down to the real business preparations necessary to the handling of next year's crop the more successful will be the organization's start.

The state and county promotion organizations, the many growers already signed up, and all the interests in the communities concerned, combine to endorse and urge this step. Mr. Grower, can you hesitate or fail to heed the universal endorsement of these interests, all as vitally concerned as yourself? You can afford to sign, because you can not afford to dally with this opportunity.

THE PRUNE AND APRICOT GROWERS INFORMATION BUREAU.

By J. C. SHINN, Niles, Cal.

Many years back in the course of the dried fruit business most of the early fruit handlers in San Francisco failed at the business, which was probably even more of a speculative business then than it is now, and no one could tell about the market. I remember one year these speculators believed they could handle peaches at, I think, 18 or 20 cents a pound, and were very anxious to buy and control for future delivery all there were in the state, but there was suddenly a slump and the price dropped back to 7 or 8 cents, and some of the dealers were bankrupted. Sooner or later practically every one of the old-time firms, who were handling dried fruits, failed. The business has settled down to some extent, but just recently I was told that one of the large firms was practically bankrupt.

The great point that appeals to me in these organizations is the control of the market, the possibility of guaranteeing to jobbers and Eastern dealers that they won't be caught with a large stock of goods on their hands when values depreciate. The question is, of course, how to start the market. I suppose the proposition is to start it at a safe figure and later the thing will average up all right. The goods will be fed into the market and pushed and there will be no slump. The goods will be cared for here in central depots and given out as the market can take them. There may even be an advance in price if the market warrants it, but the buyer will be protected against a slump anyway.

I was president of a cooperative fruit drying association for some years. Although we got along all right for some time, we finally decided to disband because of the uncertainty about the whole matter. When the fruit was dried and ready for sale we were not in touch with the Eastern markets and could not tell what the conditions were. If dealers came along and offered a good figure we sold and later on the price might advance. Such fluctuation made a great deal of difference to the growers. The old organization had no means of keeping informed, but it seems to me this present organization, as planned, will be in a far better position to keep posted on markets and demand, and so should be able to sell wisely. I was ready to go into it when it was first started and it seems to me there can be no mistake about it now. It is organizing along the lines of several very successful organizations. Of course, success will depend largely on the management, and the personal equation must not be overlooked. Will the right man be placed in charge of the handling and selling of the goods? Will he be able to judge the market correctly and sell when he should sell? The work of the organization will be simplified by the establishment of certain brands that should be placed on the market at certain definite prices, perhaps cutting out much of the intermediate profit and a good deal of waste labor in marketing. We must put the right men in the right places in these organizations. Years ago we had no trained men, but now the men that have been trained with the orange growers' organization and the raisin organization will be valuable men to have in connection with these newer organizations. The establishing of

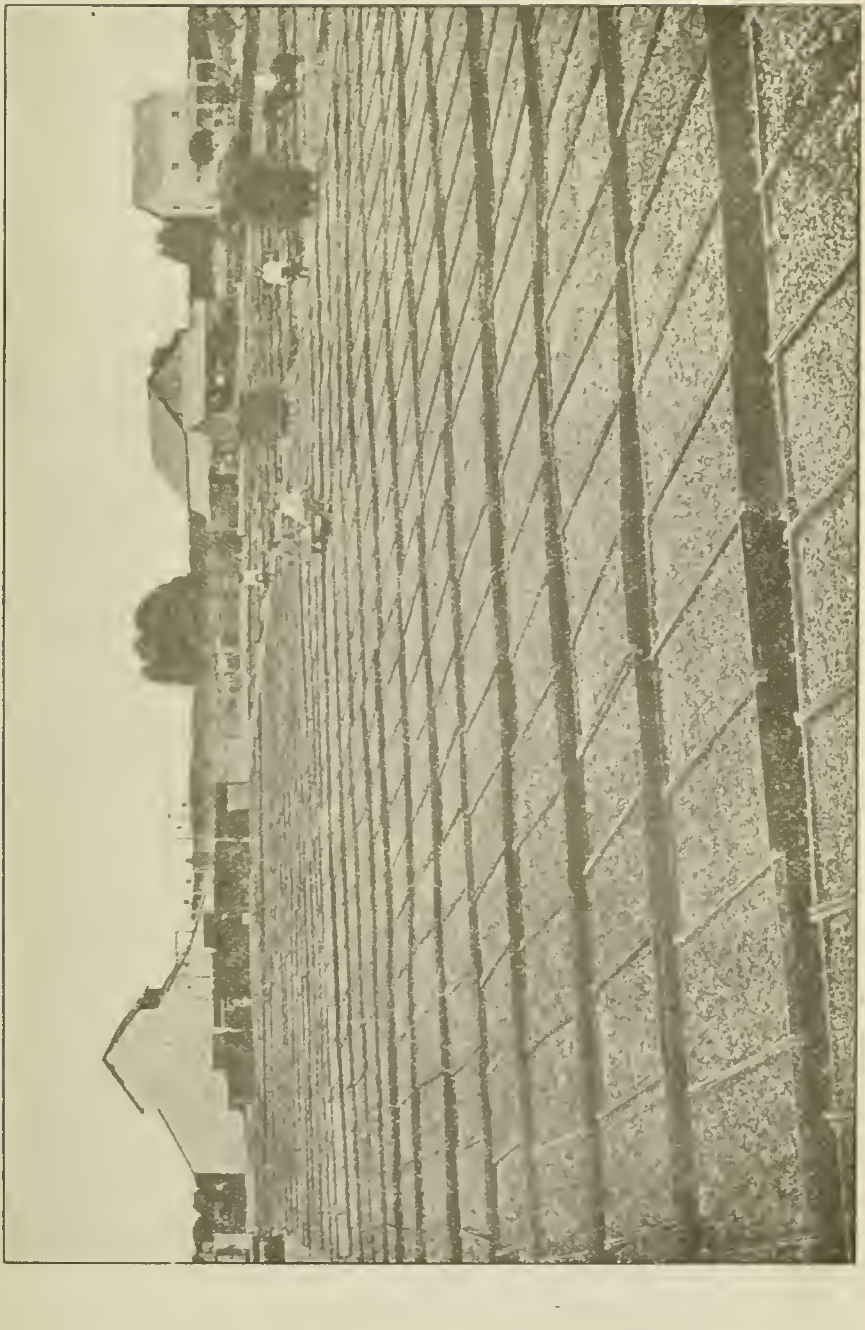

Fig. 43. A typical sun-dryer in California. This photograph is of an apricot drying yard in the Santa Clara Valley. Note the character of the pitting shed and the sulphur houses. (After Wickson.)

certain brands and certain fixed prices, as with breakfast foods, would mean much to the industry. A brand should be advertised until everybody knows what it is. as in the case of certain brands of oranges, which can be depended upon as fixed and reliable. Certain grades should be used for certain brands. One packer said to me, "The market is so strong I do not have to keep my goods up to standard." On the other hand, when the market is depressed a packer may ship a lot of goods East, that are absolutely up to standard, the consignee finds that he can not make sales, claims the goods are not up to grade and rejects the car. This organization is going to protect both ends of the line.

The county of Alameda, in which I live, is a difficult county to interest in dried-fruit organizations. We are close to the canning factories and we sell our apricots very largely to the canners, and a great many of us joined the organization just for the sake of helping the general market. In my own case, I plan as a rule to sell my fruit direct to the canners, but I thought it paid me to go into the organization because it steadied the market for the fresh fruit as well as for the dried fruit. We have a great many foreigners farming in Alameda County in a small way and I did not suppose they could be convinced that it would be to their interest to go into the organization, but as a matter of fact, a great many have taken advantage of the opportunity.

STANDARDIZATION OF THE APPLE UNDER THE ACT OF 1915.

By F. S. JEROME, President Watsonville Apple Distributors, Watsonville, Cal.

Standardization is a question every grower should seriously study and consider, irrespective of the kind of crop grown, for the subject has a vital bearing on the income every grower must naturally be interested in securing. It has been stated that standardization is called for by all interested, except the grower, but I hold that growers in all lines are beginning to appreciate more and more what standardization will do for them as they realize the benefits to be derived by the application of this measure.

Before taking up the act of 1915, I desire to draw your attention to what has gone before in an effort to better conditions and which paved the way for that act.

The first commercial orchards set out in the Pajaro Valley were planted in 1858, according to the late C. H. Rodgers, the first horticultural commissioner in this district, whose untiring efforts to improve the care and thereby the crop for harvest, deserves special mention; in fact, no record of what has been done to standardize the apple would be complete without full credit being given him, and I desire to record some of the comments made by him on the apple industry in the year 1900, as follows:

"The first strong lasting demand for Pajaro Valley apples dates back to the decline of the industry in Santa Clara and other bay counties which had been supplying the markets of the state with apples. Almost simultaneously two of the worst pests of the apple made their appearance in those districts, the pernicious or San Jose scale from the Orient appearing in 1873, and the codling-moth from Europe, by way of the eastern states, in 1874. Unable to check the inroad of these pests, the orchardists of those sections became discouraged and, one by one, dug up their apple orchards, so that by 1880 there was scarcely an apple tree left of over a million that originally had been planted. With the decline of the industry in the sections mentioned, dealers began to search for apples in localities in which the pests had not secured a foothold. Up to 1876 no fruit pests had put in an appearance in the Pajaro Valley, but codling-moth was brought into the valley in old boxes shipped in in 1877. San Jose scale made its appearance in about 1880 and probably originated from nursery stock brought from San Jose. The struggle against these insect pests and diseases was a hard-fought contest, the outcome varying at times from hope to despair and without which struggle, ending as it did in a means of control over all those pests, the fruit industry of the Pajaro Valley would have been reduced to insignificance."

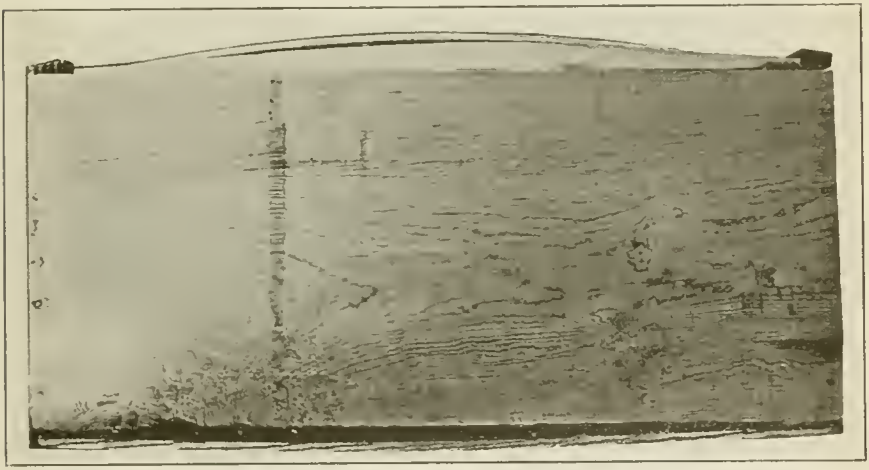

Fig. 44. A well packed box of apples showing a ¾ inch bulge at the top. (After Geo. P. Weldon.)

As the struggle to control insect pests and diseases could only be overcome by spraying the trees, the early experiences of the progressive growers along these lines were almost disheartening, as the packers for several years refused to buy apples where the trees had been sprayed, claiming the fruit was poisoned, and the grower who sprayed saw his neighbor, who did not spray, sell his inferior fruit, while no buyer could be found for his perfect fruit. However, perseverence won the day, for it was not long before buyers appreciated the improved condition of the apples as a result of spraying and the demand for clean fruit at better prices, in preference to the poorer quality, was the reward for the additional cost and effort put forth in the proper care of the orchards.

While the foregoing refers more particularly to the pests and diseases experienced in the culture of apples, if the work undertaken had not been well done there would have been no call for the standard apple act of 1915, for if fruit is not well grown no amount of standardization will put good fruit on the market.

After effectively caring for the pests and diseases with which the orchardist was beset, the pack came in for attention; the early pack having been what is generally known as the jumble pack, the top being faced while the balance of the apples were placed in the box in any old way, the bottom of the box being nailed on at the finish. Some time later better methods were practiced, a solid pack having developed, which was a marked improvement, but unscrupulous packers took advantage of the buyer, by facing with sound fruit, while placing poor quality and pest infected apples in the center where they would not be easily detected. This and other causes brought about an investigation of markets, which resulted in recommendations for better and more honest packing methods.

About this time, the year 1900, the first attempt at compulsory standardization was inaugurated; the horticultural commissioner appointed three inspectors to inspect the apples in the packing houses as they were being packed; however, this progressive step was too advanced an idea at that time, and met with little favor from packers, who generally opposed it, as the growers and packers had previously opposed spraying.

While the apples grown were supposed to be packed in a more or less uniform manner, it will be seen no standard was lived up to; the pack differed from year to year with the varying condition of the crops grown, as well as the will of the packers, so that buyers never knew what they were getting without having a personal representative or inspector in the packing house while the fruit was being packed. This condition and the improved methods used in some of the other apple-growing sections on the Pacific coast, rapidly coming to the front in the production of apples at this time, resulted in a back seat for the apple industry of California, which had been in the lead up to this period, and gradually reduced prices for the product of the Pajaro Valley was a natural and inevitable result, particularly in years of plenty, so that the grower did not realize, year in and year out, the real cost of production.

The situation, briefly outlined, continued on until the bumper crop of 1912, when an attempt to fix and maintain prices was tried, but no standard pack was even suggested and the disastrous failure experienced was a natural consequence. The crop of 1913 was unusually small and good prices, or what were considered good prices, were realized, but the large crop produced in 1914 resulted in a most disastrous season, and some of the packers realized that something must be done to remedy the deplorable conditions, under which each packer and grower was a competitor with his neighbor. To remedy this situation, organization was necessary, and the first difficulty to be considered was the unregulated pack. Therefore, a number of vitally interested parties got together and worked out the suggestion for a voluntary apple standardization act. This movement was continued until it resulted in the ultimate passage of the standard apple act of 1915, as the apple standardization bill is called.

Under this act the inspection of apples while being packed is done by officers appointed by the State Commissioner of Horticulture, who appoints them under civil service regulations, examinations of applicants being held for that purpose, and thus an absolutely fair inspection is assured at the point of shipment and the inspectors are removed from any local, political or commercial influence.

The results of this measure have been most beneficial to all interests, but after an experience of two years we believe some changes could be made which would be of material advantage to the industry, particularly as only one grade was established in the act, and it is quite apparent to all that some provisions should be made for at least one more grade, for it is manifestly impossible for all the apples suitable for market to come within the standard act. The present standard is for the highest or finest grade. Another grade should be allowed and standardized by the state so that growers and packers who do not want to pack apples of uniform size within each box can have a standard for that class or grade. Besides, there are some slight defects not injurious to apples for human consumption nor permissible in the first grade, which could properly be allowed in a second grade pack. Rotten apples, wormy or diseased apples should under no circumstances be permitted to go out of any district in the state to be sold to the public in boxes.

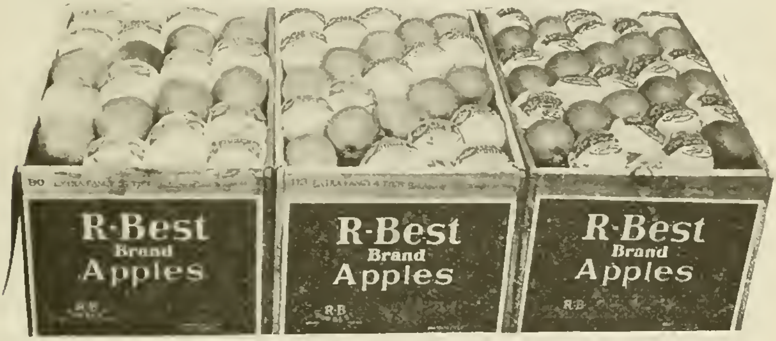

Fig. 45. Yellow Bellflowers illustrating 3½, 4 and 4½ tier packs.
(After Geo. P. Weldon)

Believing some of the experiences of the past two years will be of interest, I desire to record that the reputation gained last year, the first time a real standardization of pack was possible, has had far reaching and beneficial effects on the buying public. This is well evidenced by the fact that an order for one hundred cars of apples has been turned down within the past two weeks, because the apples were not packed standard. In explaining why these apples were not packed standard, it is fair to say that some of the packers took a back slide this year, after packing standard last year, thinking their reputation had been restored by one year of honest pack, particularly as last year was an exceedingly hard year to start standardization mainly because of the inferior class of apples grown. The poor quality was due to climatic conditions and lack of spraying because the growers were discouraged on account of the small returns received. It appeared hard to some of the growers because so many apples were forced into the cull pile, although the dried fruit brought good prices before the season closed. This year dried apples have commanded exceptionally high prices. This culling out of poor stock is of real advantage, as the crop of packed fruit for market is reduced and the offerings being better in quality and less in quantity, naturally prices are higher. Another reason some packers decided to go without standardization this year was because some of the local brokers told them the crop of this year was so free from defects, more spraying having been done as a result of the work of our chief inspector, who spent his time after last year's packing season ended, in the orchards, advising with and encouraging the growers.

We are hopeful that the standardization law may be made compulsory to the extent that every packer failing to live up to the requirements of the act will be forced to indicate on the box or container by some mark that the apples therein are second grade apples.

Another feature of particular interest this year has been the requirements of buyers for the English market, which has been our best market this season. These buyers have in practically every case demanded standardized or inspected apples when the same was made f. o. b. shipping point. This has also been the rule for nearly all sales where the apples were going outside of the state of California.

One other feature should be noted, and that is the improved pack generally, as a result of the standardization law. Many packers have seemed to be unwilling to pay for the cost of inspection, viz: one-half cent per box; yet they have either recognized its value, or felt they could not sell their apples put up in the old style inferior pack. They, therefore, of their own accord put up a much better pack, using more care in sorting and in every way improving the character of their product for market, which has resulted in less rejections at the final destination and less delay in the return of the proceeds from sales and, of course, less friction between the buyer and seller. Such friction is sure to occur when the buyer finds upon examination that the goods purchased are not up to representation. Pajaro Valley apples stand higher in the markets of the world today than they have for many years past, all of which speaks well for what has been accomplished in the short space of less than two years.

The final test is, I believe, a monetary one and it is safe to say at this time that there is at least $500,000 more money on deposit in the banks of Watsonville than was the case one year ago, or two years ago, while many growers have paid their store bills in full. The returns from the crop for a number of previous years were not sufficient to fully care for the grower's requirements. The returns this year, however, have come in much earlier than for many years past and are much more satisfactory. They are, however, still far below what could be realized by better organization; we therefore look confidently into the future, for the advancement already made with standardization insures a continuation along these progressive lines. The framers of the standard apple act of 1915 have much to be proud of, with absolutely no regrets, and with proper provision for a second grade along the lines herein outlined, the act will be one of the best on the statute books of this state.

SCIENTIFIC DISTRIBUTION OF FRUIT.

By HARRIS WEINSTOCK, Director, State Commission Market, San Francisco, Cal.

One of the first things I did immediately after my appointment about a year ago as the first State Market Director of California, was to make a survey of the Eastern markets, to familiarize myself with the marketing conditions of the East. I for one, and I think you sympathize with me, keenly appreciate the fact that unless we can find the broadest possible markets for the two hundred and one million dollars' worth of fruit and perishable products raised in the State of California, we will find ourselves submerged by calamity. Just imagine the condition we would be in if we had no market ouside of California for our two hundred or more million dollars' worth of products from our vineyards, farms and orchards! In order that our home market may be kept in a healthy condition, and may not be submerged, it is of the greatest importance to develop and to aid in developing our Eastern and our foreign markets so that our home markets may be kept in a healthy condition.

As a result of the survey made through the large Eastern cities, I found that in the more recent years splendid work had been done on the part of the exchanges, on the part of the private shipping companies and on the part of the distributing associations, along the lines of finding new markets for California products. I keenly appreciate that fact all the more when, as I stated this morning, as far back as thirty years ago 1,000 carloads of California fresh fruits glutted the markets; and now at this time, despite the fact that vast acreages in such states as Colorado, Arizona, Oregon and Idaho and Washington have come into bearing, in direct competition with California, we are marketing in the neighborhood of seventeen thousand carloads of fruits a year, showing clearly that splendid work must have been done on the part of the exchanges and shipping organizations in developing markets.

I saw no way to improve upon what had been done along the lines of market development. I think that end of it is well handled, but I found one serious weak spot in the method of distribution that has cost the growers of California—and will continue to cost them possibly hundreds of thousands of dollars a year, a weak spot that has never been brought effectively to their notice—and that weak spot is blind shipping.

When it comes to nonperishable products, the only loss sustained by blind shipping is the loss of reshipping. In other words, if we would overload the Chicago market or the St. Louis market or the New Orleans market with our dried products, the only loss involved would be the expense of diverting and reshipping, but when it comes to perishable products it is of the utmost importance that there should be the most intelligent, scientific distribution. Gluts mean a needless waste to the growers. A product that ought to bring $2.00, if the market is seriously glutted may only bring a fraction of $2.00, to the loss of the grower.

There are competing shipping organizations. We have the Exchange, which represents about 15 per cent of the deciduous fruits. We have what are known as the Distributors, representing fifteen or sixteen of the commercial shipping companies, organized into a shipping association, and then we have several independent shippers. Now, the general feeling, as a rule is that in order to get the best results I must hide my movements from my competitors and I must get all the underground information concerning their movements that I can, so that I can take advantage of any ignorance on their part and get my fruit to the best possible places before the other fellow gets his fruit to the best possible places. That is the theory, but practically it results more or less in market feasts and market famines. As a consequence there are many serious losses.

The question arose, what can be done to remedy this? It seemed to me that the remedy is simple and inexpensive. The remedy as I see it is to establish a clearing house of information, a clearing house of distribution, where all the information concerning shipments can be concentrated—a clearing house to disseminate information and turn on the light so that every factor would ship with the highest degree of intelligence, instead of shipping in the dark.

I found, however, on further investigation, that I had been anticipated in that idea—that already the state had an object lesson along these lines. The anticipators were the cantaloupe distributors down in the Imperial Valley. I do not know whether you men and women are familiar with the story of the Imperial Valley cantaloupe industry. For the information of those of you who may not be familiar with it, let me brief it. Imperial Valley, as you doubtless know, has the reputation of raising the largest and the finest crops of cantaloupes that can be raised anywhere in the world. I see a gentleman over here shaking his head.

Gentleman referred to: I am from the Turlock district.

Mr. Weinstock: All right. The Imperial Valley ships the finest cantaloupes in the world barring Turlock. The Imperial Valley has this further advantage, that it ships its cantaloupes at an earlier time than do most other localities, giving it the advantage of an early market. In spite of those advantages, the cantaloupe industry in the Imperial Valley was in a very bad way, year after year, due to blind shipping and to the fact that competing shippers were trying to hide their movements from each other and trying to put "one over" on each other. The result was chaos, gluts. The situation had become so desperate that by the year 1914 the distributors finally came together and said, "This thing won't do. Let us organize a distributing association and let's put our cards on the table and let's ship with intelligence in place of shipping blindly." They had not been organized very long before Uncle Sam pounced on them and indicted them for violating the Sherman Anti-Trust Act in restraint of trade. The next year they were in great distress and finally they went to Uncle Sam at Washington and said, "What shall we do? Up to 1914 our industry was practically a failure because of unenlightened distribution. In 1915 we organized and you indicted us for alleged violation of the Sherman Anti-Trust Act. We are evidently damned if we do and damned if we don't." And so Uncle Sam in his wisdom through the Marketing Bureau at Washington sent out a representative at once to Brawley, the chief shipping point of the Imperial Valley, and this Federal representative got the distributors together and they organized what Uncle Sam would call a bureau of information, but what I would call a bureau of distribution. Every morning the distributors through their representatives sent in the information to the head of the bureau, setting forth what they proposed to ship that day and where they proposed to ship it. That information was tabulated on a blackboard, the distributors by representation and in advance having agreed what would be a fair quota for each market. When this information is tabulated on the blackboard and the diversions and transfers en route added thereto, it instantly brings to the eye the overloads and the underloads and a readjustment takes place. By a system of "give-and-take" between the distributors, they relieve the ever-burdened markets and fill up the under-supplied markets, thus minimizing waste and making the distribution scientifically and intelligently.

I was glad that the Imperial Valley had anticipated my idea, because I felt that I would no longer be dealing with a theory. I would have an object lesson that I could point to as a demonstration; and I began to advocate in the early part of this year the wisdom, the necessity, and the importance of the distributors and shippers getting together and organizing this proposed state bureau of distribution. Eighty-five per cent of the fresh fruit shippers signified their readiness to organize, but the unexpected happened. The first people, I thought, who would avail themselves of this plan would be the Exchange, because the Exchange is a cooperative society. But to my surprise practically every shipper came into the plan except the Exchange. The only satisfaction I could get from the Exchange and from my old friend Mr. Nagle, the manager, was that he would take it up with the board of directors. When I came to talk to him about it he surprised me very much by saying that in his judgment it was not necessary, that the distribution was satisfactory as it was, and he had means of keeping himself informed on what the other fellows were doing and he saw no occasion for the Bureau, but if the time ever came when I could prove to him that there was occasion for it, then, of course, he was ready to listen. The time came when I was prepared to prove to him that there was occasion for it. The time came when I could do that, not by argument but by facts, but so far as I have been able to ascertain, Mr. Nagle has not yet changed his mind.

Objections have been raised to the plan and before I take up these facts that I am going to present, I want to take up the objections.

There are those who felt the state ought not to "butt in," that it was not wise to have a political machine have anything to do with the growers' associations and I am frank to confess that, if some years ago under the old political conditions, somebody had come to me as a farmer and producer and had suggested the idea of having anything to do with the state commission, I would have said, "Not on your life." If that suggestion had been made at a time when California, as you know, had the finest legislators that money could buy anywhere, I would have said, "Not on your life," because I would have had no assurance but what some hothouse politician or some ward heeler might have been foisted on the growers in payment for some political debt, some hothouse politician, utterly unfit for the job. But, thank God, we are no longer living under the political period that gave us political bosses. Political bossism has been buried so deep that neither you nor I nor our children, nor our children's children are likely to see the day when the political boss in California will again raise his head. There is just one change in our laws that has brought about this political revolution, that has cleared our political atmosphere, and that one change in our laws was the amendment to the constitution, I think it was, that wiped out the political convention and replaced it with a nominating primary. You say at first glance, "I don't see quite the importance of that change." I will make it plain in a few words. Under the old system of political convention it was a very simple matter for a political boss to bribe a certain other gentleman, who, in turn, would bribe certain members of the nominating convention, which in turn would nominate candidates for public office. Under those conditions, we were politically like driven cattle. We had no voice in the selection of our public officials. Conditions such as existed in my own city of Sacramento could be found everywhere throughout the commonwealth. To cite you an instance that came under my own notice: There was to be a mayor elected in Sacramento; I went down to the polls to vote. Inadvertently I found myself standing behind the political boss of the town, a great, big saloonkeeper, and inadvertently I overheard him say to one of his lieutenants standing on his left, pointing to a decent neighbor of mine, "There goes one of those purity fellows to vote. He thinks he is going to vote for the man of his choice, but whichever one of the two candidates he votes for, he will be voting for my man, because I own them both." Under our present political system, it is absolutely impossible for any boss to get control, because to get control he would have to bribe a majority of the men and women voters of California, and no man living can do that. And so for the first time in the history of our commonwealth we are living in a real democracy, where you and I and the rest of us can vote for the men of our choice.

Under the present political system there are no political debts to be paid. The men elected to office owe their office to the people and not to bosses, and hence they are free to appoint men on merit and not to pay political debts. As a consequence, we are enjoying in the State of California today the most efficient and the most economical and the most intelligent state government that California has ever had, and I think we will continue to enjoy that government so long as we adhere to our system of political primaries in place of political nominating conventions.

Living, as we are, under a real democracy, we are just as safe in inviting the state to lend us its aid and its support and its cooperation as are the people who live in Germany, as are the people who live in Austria and France and England and Ireland and Italy, where they gladly welcome the cooperation of the state in guiding and directing their movements of this kind. So, to my mind, the criticism that a movement of this character is inviting a political machine to put its hand into our private affairs will not stand.

The next criticism that has been offered is this: Granting that your State Market Director is honest and granting that he means to do right, what in thunder does he know about distributing seventeen thousand carloads of fresh fruit a year? I don't know anything about it, but I don't propose to do the distributing. I would invite the distributors in proportion to the tonnage they ship to select from their own group five representatives. I would ask these five distributors to select the best man that could be found anywhere in America to take charge of the Bureau, and I would appoint him as a deputy of the State Commission Market. This man, subject of course to the rules and regulations of the State Market Director, would be guided by the advice and counsel and judgment of the five best men among the distributors. Under such a plan every shipper would be guaranteed a "square deal." The state could not afford to be party to anything but a "square deal" because this whole movement being purely voluntary it could exist only so long as the members felt that they were getting a "square deal." Just as soon as they felt favoritism were being exercised, the thing would disintegrate. It could not stand. Hence, if the state would want to perpetuate the movement, the distributors must be assured of an honest effort. They would be assured of intelligent effort because their best brains would be placed at the disposal of this bureau of distribution.

So much for the criticisms that have been offered against the plan. Now for the facts. Theories sometimes are very beautiful. You may have heard the story about Professor Agassiz. One day he was sitting on his veranda chatting with an old New England friend. The conversation drifted to a discussion of a certain variety of fish. The New Englander went on to say that that particular variety of fish was to be found in a stream running through his New England estate. Professor Agassiz said, "That is impossible. Science has proven that that kind of fish cannot live under those climatic conditions." The next day, when the New Englander returned home, he went out and caught one of these fish and expressed it with his compliments to the professor. The following morning he received this telegram, "Your little fish has kicked my big theory to death"; and so we find that a little fact will often kick a big theory to death. My old friend, Manager Nagle, tells me you do not need a bureau of distribution. It is a waste of effort. I have here a chart showing the movement of Bartlett pears for one week in the city of New York, giving the quantity sold for each day of that week, Monday, Tuesday, Wednesday, Thursday, Friday. You will observe that the total, the aggregate shipments for that week, was about 83,000 boxes. If you or I controlled these pears and we were going to market them in the city of New York, we would naturally want to distribute them over the week as intelligently as possible. In

Chart Showing Movement of Bartlett Pears for One Week, in the City of New York.

Day	Date	Cars	Boxes	Average
Monday	July 24	52	27,100	$2 04
Tuesday	July 25	27	14,045	2 21
Wednesday	July 26	23	11,765	2 48
Thursday	July 27	28	14,550	2 48
Friday	July 28	31	16,195	2 57

order that they would realize their fullest value, we would distribute them over the week as you would spread butter over bread. Let us see how they were distributed. You will observe that on Monday there were 27,000 boxes placed on the market, almost double as much as were put on the market on Tuesday. Tuesday there were 14,000 boxes; Wednesday, 11,000; Thursday, 14,000, and Friday, 16,000 boxes. Observe what followed. On Monday the price realized was $2.04 a box for the 27,000 boxes. The next day, when the supply was cut nearly in half, the price went up to $2.24, and then to $2.48, and again to $2.48, and on Friday to $2.57 a box. Now, it is not difficult to understand that if that oversupply on Monday had been intelligently spread over the week, the price received on Monday would have more nearly approximated this average, which was $2.43 a box for those days. But Monday was overloaded. When there are two boxes of pears running after one buyer the price of pears is low and when there are two buyers running after one box of pears, the price of pears is high. That is the law of supply and demand. You cannot get away from it. If the pears offered on Monday had realized the average for the week of $2.43, it would have made a difference of just 39 cents a box on Monday's sale and that 39 cents a box represents $10,608 difference. One day; one commodity; one market. Now, just multiply that by the number of commodities, for every market, for every day, and see what it means to the growers. See the hundreds of thousands of dollars a year that would be wasted. All you would know would be that you got low prices, but you could not tell why. This chart shows one of the reasons—unintelligent, unscientific, stupid distribution.

My friend, Mr. Nagle, said to me, "Your figures are all right so far as the other fellows are concerned, but we came out bully. We did fine on Monday." Let's see what happened with the pears of the Exchange. We have taken the auction catalogs for that week for the city of New York; there is no getting away from the catalogs, because they are authentic and reliable—they give the facts, not opinions, and we have analyzed the catalogs. We find that our friends, the Exchange, shipped 6,964 boxes of pears to New York that week. Mr. Nagle explained to me that on Monday he had what is known as "the first call." In order that you may understand what that means it may be necessary to explain that the shippers rotate day by day. Suppose there are three shippers. Shipper Number One would sell first today, Number Two, first tomorrow and Number Three, first day after tomorrow. It is regarded by some as being an advantage to have the first call. Mr. Nagle informed me he had the first call on Monday and therefore he loaded up on Monday. That he loaded up is made evident by this fact, that he put on the market 52 per cent of his week's offering, 3,600 boxes out of 6,964. I am told by someone who took the trouble to look it up that the Exchange pears on Monday averaged $1.99. That may be or may not be correct, but $2.04 was the general average. Now, the next day 23 per cent of the week's supply was put on by the Exchange; the next day, 11 per cent; the next day, 7 per cent; and the next day, 7 per cent, and what follows? The members of the Exchange had 52 per cent sold when the price was lowest and only 7 per cent on Thursday and 7 per cent on Friday, when the price was highest. Is that intelligent distribution? Is that getting all that can be gotten out of the situation? If my friend Nagle thinks so, why I would have to say to him what that youngster said to his Irish dad. Mickey came home one day from school with the tears streaming down his cheeks and his father said to him, "What is the matter, Mickey"; and Mickey said, "The teacher licked me and you are to blame for it." "I am to blame for it?" "Yes," said Mickey, "You are to blame for it. I asked you the other day how much was a million and you said it was a hell of a lot, and it was the wrong answer." [Laughter.] So, if my friend Nagle persists in thinking that the distribution was along the line of the highest intelligence, like Mickey, I would have to say that it was the wrong answer. It would not satisfy me if I was a member of the Exchange and knew these facts. Of course, if I did not know the facts and got a return of $2.04 a box and last year I got only $1.04, I would feel very happy and I would think the Exchange was bully and the management was splendid. But if I knew all the facts in the case, if I knew that the general average could have been larger, and could have been made for that day, with intelligent distribution $2.43, I would be exactly like that man who was approached by the census taker and who had to answer all sorts of questions. He got along all right until he came to the question, "Are you married?" and he said, "Yes, I am married, but dissatisfied." With the facts before me as a member I should be obliged to say, "I am entitled to every penny my product is worth and I did not get it. I am dissatisfied."

This morning there came to me yet another fact showing that we are getting further and further behind, that in place of we California fresh fruit growers leading in this matter of distribution, just as we did in the auction business, which has since been adopted by the citrus growers, by the banana growers, by the citrus growers in Florida and more recently by the Oregon apple growers, just as we ought to have led in this scientific method of distribution, we are finding ourselves to be tailenders. This morning there came to me this clipping from a publication issued in the northwest called "Better Fruit," which shows that the apple distributors of the northwest have seen the folly of their ways of the past and have profited by the experience of Imperial Valley and likewise have established a bureau of distribution. Here is what it says: "Apple distribution in the United States. (Editor's note.) The following is a sample report mailed daily from the office of Markets of the Department of Agriculture, Spokane, in connection with fruit growers' agencies. Every grower should read this to fully appreciate the reliable information that is being furnished daily by the office of markets in cooperation with the fruit growers' agencies." Then it goes on to tell of three or four different markets. It tells how on the preceding day there were shipped out seven carloads to New York, three carloads to Baltimore, four to Albany, and so on down the line, and then it goes on to show diversions reported yesterday, from Minot one, Grand Forks one, and so on down the line. Now, with all of this information blackboarded, showing almost instantly the overloads and the underloads, we see what a great advantage the distributors have when they know how to distribute their product with the highest degree of intelligence, giving them the opportunity of doing their business with the fullest light.

This is my message to you, my friends, and this is the story. If the fruit growers of the state of California and the members of the Exchange are satisfied, the state must rest content. If you as fruit growers and you as members of the Exchange are perfectly willing that this shall go on, well and good. I should then feel as did that youngster when his Irish daddy said, "Mickey, where would you be if I died?" And Mickey said, "Oh, I would be here all right. The question is, where would you be?" And so, if you, my friends, are satisfied with the existing system and the present unenlightened method of distribution, why, I am satisfied. I have no compulsory powers under the law. I cannot stand over the fruit growers of California and say, "You have got to come into this proposition." It must be purely a voluntary arrangement. My function is to bring you the facts, to present to you the conditions and to point out the way. The rest must depend upon you.

I feel that I can now leave this whole matter entirely in your hands and abide by your decision.

SCIENTIFIC DISTRIBUTION OF FRUIT.

Discussion by **J. L. Nagle**, Manager of the California Fruit Exchange, Sacramento, Cal.

Before I have anything to say regarding the California Fruit Exchange, I trust that Colonel Weinstock will permit me to correct two of his statements.

The first is that I have no recollection of ever having said that the fruit growers of California did not need a state market bureau, but I did say emphatically (and I trust I will be able to show you facts why) the California Fruit Exchange does not need a state market bureau.

Secondly, it is evident that Colonel Weinstock has accepted the statistics of our sales from our competitors. He believes he is honest in his report when he says that our average on Monday, July 24, was $1.99. Instead of that, Mr. Weinstock, I trust you will accept my figures, which are correct. Our sale price on Monday was $2.06 and our high mark was $2.50. We never reached a mark as low as our competitors.

Now, before I will go into the details of this chart, considerable has been said and made public by Mr. Weinstock with reference to the nonadherence of the California Fruit Exchange to the proposed state market bureau plan. It is coincident that at the Thirty-Third State Fruit Growers Convention held sixteen years ago in the city of Fresno, that as a result of the chaotic condition of the deciduous fruit industry of the state, there was conceived at that time a fruit growers organization then known as the California Fresh Fruit Exchange. This institution was cooperative in principle and policy and organized by fruit growers for the betterment of conditions and for the uplift of the industry, which at that time was in a deplorable state. Growers were receiving "red ink" sales and were forced to put mortgages on their farms, and as the industry was in the control of speculators, it became necessary to wrest it from their hands and place it under the domination of the fruit growers; otherwise it meant disaster for the state of California. From the California Fresh Fruit Exchange has grown the present institution the California Fruit Exchange, of sixteen years standing. We have fought political, financial and commercial interests opposed to the organization of the growers until some of us have almost sweat blood and lost thousands of dollars in furthering the interests of the Exchange, but today we stand alone, the only cooperative organization handling deciduous fruits in California. We are an institution of seventeen hundred fruit growers traversing the state from the Imperial Valley to Shasta County.

We have listened to the arguments in the press and through circular letter issued by Mr. Weinstock recommending that we join the bureau and denouncing my attitude as manager. I stand here today to read you a proclamation from all of our people commending the stand taken by our board of directors. This is indicative of their entire satisfaction.

We have handled three million dollars worth of fruit this year and in the sixteen years we have been in business we have never lost one dollar from Eastern collections. We have developed two hundred fifty markets and we have taken advantage of every opportunity to secure for our people better results than they have ever had before and in this we have been entirely successful and willing to stand on our own record.

We have declared and paid to our fruit growers over half a million dollars in dividends and have collected and paid over three hundred fifty thousand dollars in railroad claims, something that was unusual, as you probably know, before the organization of the Exchange.

I want to say further that I haven't anything against Mr. Weinstock, in fact I have the highest regard for him as an able man, but consider him absolutely incompetent to tell me how I should run my business, and I consider the Exchange a scientific marketing organization. I consider him incompetent to regulate this industry, as he is not familiar with the present system of marketing. Furthermore, he has accepted as a basis of criticism of my action a letter from the Stewart Fruit Company in which is stated that had they known in advance the number of cars or the number of boxes of pears that were to be sold in New York on Monday, July 24, they would not have "played" the market so heavy. Gentlemen, for your information, the Journal of Commerce, printed daily in New York City, shows and is within reach of every receiver, the number of cars that are to be offered on the market twenty-four hours in advance, and from another source all the receivers know forty-eight hours in advance what is to be sold. If the Stewart Fruit Company did not know how many cars were to be offered for sale on Monday, July 24, then their agent in New York or in California was negligent in his duty. I contend that the Stewart Fruit Company owes its people an apology for indiscriminately marketing all of these years the fruit of their clients without having any information in advance of what competitors were going to do; and, furthermore, I contend that Colonel Weinstock owes his governor an apology for accepting the position that he holds when he accepts as a basis of criticism of us an unintelligent letter that Mr. Stewart had the audacity to write, and make public to you people.

I am not here to criticise Mr. Weinstock or the State Market Bureau, or the growers who need it and want it, but our records show that we do not need it.

Gentlemen, as Colonel Weinstock has told you, there are three auction markets and several receivers in New York City. The California Fruit Distributors and ourselves sell through the Connolly Auction Company the Stewart Fruit Company through the Fruit Auction Company and Sgobel & Day through Brown & Seccomb. This room somewhat resembles an auction room except that the seats in an auction room are arranged in tiers. The auctioneer stands here and at a long table or desk are the representatives of the different receivers. It is not possible for all of the shippers or all of the auction companies to sell at one time, consequently at the beginning of the season a schedule is arranged similar to that made up by baseball managers in arranging the dates for the different teams to play in the different cities so that there will be no conflict. The Stewart Fruit Company sold first on that day on the Fruit Auction Company's catalog. The California Fruit Exchange sold first on the Connolly catalog. It takes from about 8.30 in the morning until between 4.30 and 5 in the evening to sell between seventy and eighty cars of fruit. There were seventy-six cars of California deciduous fruit sold in New York on that day. It is always conceded that the most enviable position on the catalog is the first place, and on that day we were first, being ahead of the California Fruit Distributors who had the bulk of the offerings for the day. Consequently, as the California Fruit Exchange does not attempt to dictate the disposition of its offerings for the day, being 4,000 miles away from the market, the same is left to our representative in New York, a man who has had 25 years of experience and a man who has proven his worth. Mr. Black our representative, wired us on Saturday preceding the sale that we had a certain number of cars on track and wanted to know our ideas as to selling the same. We suggested that the offering was too heavy and, consequently, four cars were held on track and the balance offered for sale on the following Monday, July 24. Our reason for selling the number of cars that we did was due to the fact that we were first on the catalog and, furthermore, that four of the cars had been rejected cars which had been previously offered for sale in private sale markets and on account of being in weak condition were rejected and because of their condition it was necessary to sell them as soon as possible. Furthermore, six of the cars were from one shipping station and were billed New York to be sold upon arrival; this at the request of the shipper.

All of the members of the California Fruit Exchange are members of their own volition and there is nothing to hold any one against his wishes. We haven't any liability other than our capital stock and fortunately we have been able to build up a very healthy asset. The growers are independent and they have the privilege of stating where their cars should be sold, and when the disposition of cars is left exclusively to our sales department, we use the knowledge we have available regarding markets to place our cars to the best possible advantage.

We have in the audience today one of the growers who sold in New York on the day before referred to who was a very heavy shipper of pears, and this grower told us that his fruit had to be sold on Monday whether there was one car in the market or ten thousand. It was his fruit and he did not hold us responsible for results, and for these reasons the fifteen cars were sold in New York on that date. We did not sell heavy for the balance of the week because the offering of the California Fruit Distributors was unusually heavy; we knew it, and as they sold in advance of us, our position was not a favorable one. We are in touch with the California Fruit Distributors daily regarding the offerings for the different markets and compare information that is of mutual advantage. We had just as many cars rolling and could have sold just as many in New York on Tuesday, Wednesday, Thursday, and Friday as did the Stewart Fruit Company, but when we were advised by our New York office that the offerings of competitors would be heavy for the balance of the week, we diverted our cars to outside markets that were located in a zone regulated by the New York auction, and these cars instead of being sold in New York, were sold at private sale on the same basis as the New York market and without our having to pay an auction brokerage. The result was that we secured the same price as the New York average and by our withdrawing from New York, benefited the market to that extent, and for our marketing in this manner are we to be criticised? We have been in business sixteen years, and surely we could not have done much "blind shipping" and been able to declare a dividend every year.

I believe Colonel Weinstock to be honest, but I do not believe that he knows anything about the present system of handling interstate shipments of fruit, but he wants to learn and he says he can not go ahead with his plan unless the Exchange comes in. I appreciate the compliment and thank him for it, but if the success of the State Market Bureau depends upon the information it must receive from the California Fruit Exchange, then why doesn't Mr. Weinstock adopt the by-laws and constitution of the Exchange and let the others follow?

I stand here and invite every fruit growers association in the state of California to become a member of the Exchange. Why should our growers, after spending sixteen years of hard labor and thousands of dollars a year in accumulating the intelligent information regarding marketing that is available through our channels, turn this information over to the state, where it may be hung upon a public file and thereby invite and create Eastern competition, a competition that has spelled disaster to the industry and has proven itself to be a parasite? When the season looks propitious and conditions are favorable, the demand exceeding the supply, the crops in the East light and the crops in the West fairly heavy, what happens? Out from the East on the fastest trains come a lot of speculators with gold in their pockets, and these men know as well as I do that when they go to the fruit grower with a proposition of gold in one hand and a guarantee in the other, he is prone to listen to it; but when there is a big crop in the East and conditions for a favorable season none too satisfactory, what happens? These same speculators remain at home and the burden of financing the industry rests upon the California operators, and it is up to us to work our full wits to handle the crop in a manner that will bring it out on the right side of the ledger at the end of the season.

Do you think it right for Colonel Weinstock to go out and criticise us, and encourage competition to criticise us? If I did not have respect for some of my competitors, I would make known here today something that was scandalous, but because one of them was kind enough to apologize for the action of one of his agents, I will say nothing.

For those of you who need this organization of Mr. Weinstock's, I recommend it, but do not think that the California Fruit Exchange is going to contribute 7 per cent a year on the gross sales for the benefit of some one who is coming to California later on. That is exactly what would happen if we went into it and built up his organization.

I think, gentlemen, that my attitude and the attitude of the California Fruit Exchange in defending the Exchange should not be interfered with by a political machine, and that is what Colonel Weinstock represents. I have nothing against Governor Johnson and nothing against Mr. Weinstock, but I do not think the state of California has any right to interfere with the individual or corporate rights of a successful institution that has shown in sixteen years that it has done more for the industry than any other organization.

Furthermore, if my memory serves me correctly, I had a talk with Mr. McPherson who was instrumental in putting through the state commission act. I had a talk with him in Dr. Cook's office in the state capitol of Sacramento and he told me that the intent of the act was to create markets in the state of California for the distribution of the farm, dairy and fishery products, on commission, by the state. I may be unduly dense, but I can not see anything in this act that justifies the action Colonel Weinstock has taken against the Exchange and myself. He may be able to explain it but I do not think to my satisfaction; and, furthermore, I have never known an institution to work out successfully that started from the top and worked downward. God knows we have slaved for years to build up and lay a foundation for our institution and we have got it, we are proud of it, and we are going to hold on to it. We invite you all to come in and we have a record that can not be beaten. We have raised more mortgages, developed more markets, and reduced the price of materials more than any one else.

We have honorable competitors in the California Fruit Distributors. They have done a lot for the industry. They are represented by a good board of directors. I know them and have worked with them. If those on the outside want to take advantage of their organization, Mr. Virden, their manager, tells me they can join his organization, and if they do not like his, they can join ours, and if they do not want to take advantage of these, then go to Colonel Weinstock and cry for help.

Colonel Weinstock has sent thousands of letters to all of the growers in the state and for fear that some of them would not reach some of the growers, he has been assisted in the distribution by some of our competitors, and I do not know of a man raising fruit that has escaped a letter.

The two organizations, the Distributors and the Exchange, control the situation without any added expense. There is nothing in the state market act that provides for a regulation of the fruit industry. There is a fund of $25,000 appropriated by the state to be used by Colonel Weinstock in establishing state markets. I know of no instance where any of these markets have yet been established, and I understand that Colonel Weinstock at the next legislature intends to ask for a further increase over the already established fund, but I doubt very much if the legislators will stand for it because they will not be able to see the necessity of it.

There is a necessity for a correction of conditions in San Francisco. I know that some of the people there do not remit honest returns and these are the people that Mr. Weinstock ought to get after because they are working under the laws of California and he is an employee of the state.

We see no necessity of becoming a member of the State Market Bureau. We are satisfied with the system under which we have been satisfactorily and successfully operating for years. As I stated a few minutes ago, we have never levied an assessment, we have been consistently paying dividends, and collecting and paying railroad claims to our growers, and as we are purely cooperative, organized and operating solely for the benefit of the industry that our members may secure a legitimate value for their products and receive the most efficient service at the minimum cost of operation, it does not appear to me that with this record we need a guardian appointed by the state of California.

SCIENTIFIC DISTRIBUTION OF FRUIT.

Discussion by A. L. WISKER, Grass Valley, Cal.

Before beginning my remarks I would like to call your attention to the fact that this is perhaps the most important matter that will be discussed at this assembly.

In connection with the chart that you now see before you I wish to call your attention to the fact that you cannot fairly judge the marketing experiences of a season by isolated comparisons, because a man who is adept in the selection of his figures can usually prove any case he starts out to if he knows where to go.

I would say in this connection that you are faced with the fact that on Monday a large tonnage reached the New York market and it sold for a low price. I might suggest that one of the contributing causes was the fact that they sell in New York on but five days in the week, while here in California the fruit ripens for seven. There was, therefore, an extra tonnage to be disposed of on Monday that represented the ripening of two additional days on the trees. However, what I wish to do is to attract your attention to the act itself under which the State Marketing Bureau exists. It was, if I interpret the act aright and if I understand the history which caused it to be passed by the legislature, an attempt to regulate abuses existing within the state of California through the commission merchants of the state. It did not contemplate at the time extending the power of the state, which stops at state lines, to interstate questions of marketing, and I question the legality of any state authority to regulate matters beyond state lines. That is one of the weaknesses.

Another fact in connection with the act was that the State Market Director was given the authority, and in fact, ordered to establish markets at any and all cities within the state at his discretion, and I believe that none have been thus established. If they have, they are only here and there, and do not represent a general carrying out of the act.

I contend that the act itself was one of the greatest mistakes by our California legislature. It was ill-conceived, false in theory and impossible in practice.

However, aside from that, let me say to you that the attack made by the State Market Commission upon the California Fruit Exchange and the California Fruit Growers' Exchange, the two cooperative market organizations of the state, is an attack upon the largest and most successful organizations, marketing practically all of the fruit of the growers within the United States. It is an attack upon the general theory upon which we are trying to advance in marketing and that is the control of marketing organizations by the growers themselves. Instead of endeavoring to rectify the abuses existing within the state, it is my contention that the State Market Bureau has used the finances of the organization in scattering broadcast through the state the letters so many of you have received, to club the California Fruit Exchange into line, and because one man, John L. Nagle, had the courage and the grit and the backbone to take upon himself the personal burden, he has been made the goat. Colonel Weinstock has fallen down on the job and he wishes to make the California Fruit Exchange the goat for his failure. That is the situation. In endeavoring to change conditions he attacks the greatest forces that are endeavoring to build up the well-being of the California fruit growers, the cooperative organizations of the state; and the organizations that are now handling the citrus and deciduous fruits under the ideas of the California Fruit Growers' Exchange and the California Fruit Exchange, have embodied in their organizations the same broad principles upon which the raisin men and the nut men and the prune men and all the others are operating. If one is attacked, it is an attack upon the general principles underlying them all. We know that in these organizations lies our best hope of success.

I would not impugn his motives. I feel that he has the best intentions. I have such a high opinion of him that I hate to criticize him as an official. I want to attack the act. I want to see it at the next legislature either amended and made beneficial and practicable and workable, or I want to see it wiped out. It is a farce as it stands. Our legislature made the initial mistake and Colonel Weinstock has made one equally great in trying to read into that act a meaning that it is not intended it should contain.

SCIENTIFIC DISTRIBUTION OF FRUIT.

Discussion by HARRIS WEINSTOCK.

I shall, first, Mr. Chairman, Ladies and Gentlemen, address myself to Mr. Wisker, the gentleman who criticized the bill and who criticized the State Market Director. For your information and for his information, I want to give you a little inside history in connection with the creation of the State Market Commission.

You will remember, perhaps, that at the last session of the legislature an act was passed authorizing the governor to appoint a Rural Credit Commission of five members, whose duty it was to investigate the question of establishing a rural credit system and a system of state land colonization. I had the honor of being appointed by the governor as a member of that commission. That commission started out to have public hearings throughout the state, in order to get the fullest possible information as to the existing conditions. Some time in August, I think it was, the governor took up with me the marketing bill. He said, "I signed this bill at the last session. I signed it because of the earnest effort on the part of the farmers of California to have that measure passed. I was in doubt as to its merits until the farmers of the state urged me so strongly that I could not resist and I signed the bill. I have held it in abeyance ever since. I have made no appointment for I was not altogether sure how it would work out. I was afraid it might involve the state in an undertaking that it would be very unwise for the state to attempt. Now, your commission is holding public hearings. I wish you would be good enough to take this bill and investigate it. Get all the criticism on it that you can and advise me what is the best thing to do under the circumstances." So the Rural Credit Commission took that bill and it was taken up at these hearings and criticisms invited thereon throughout the state. We had it analyzed by farmers, by merchants, by bankers and by real estate men, by anybody and everybody whose opinions were worth hearing. When we were through with our hearings I was prepared to make to the governor a verbal report. I said to him: "This bill has been criticized by two different schools of critics. There is one school of critics that has asked the state to keep its hands off, that doesn't want the state to have anything to do with this line of activity. There is another school of critics who want that bill carried out literally, who practically want the state of California to go into the retail and wholesale business of distributing farm products in every town and city. I do not find myself in harmony with either school of critics. I think the state should concern itself with the marketing problem, and that there is an opportunity for the state to accomplish great good in the interests of producers and consumers, but I do not believe in the state of California, especially on an appropriation of $25,000, opening retail and wholesale houses in every city and town in the state." I said, "Where I think the state can be of great service is to perform, at least in the beginning, the same function in the marketing world that the farm adviser performs in the productive world, the state to act as a market adviser, to develop markets, and to give producers the benefit of all the information that can be gathered by the state bureau. Let producers organize marketing associations, and let the bureau show them how they can market collectively." He said, "You have hit the nail squarely on the head. You have the proper solution for the problem and you are the fellow to carry it out." As a consequence I find myself here today, talking to you on this problem.

Just imagine what an interesting time the State Market Commission would have, with an appropriation of but $25,000 to cover two years, to conduct its office properly, issue bulletins such as have been issued, pay the office rent and clerk hire and the incidental expenses, if on top of that it should start in in one community alone like San Francisco or Los Angeles and establish wholesale and retail houses to handle the food supplies of such a market! It would simply be a financial impossibility. Some men might be able to do it but I should not want the job.

I have no apologies to offer, my friends. Some years ago I retired from active service and became a man of leisure, but never in all my forty years of business experience have I worked so hard as in the past year. I have given to the state the best that was in me, and what has been the result? Other men might have done better but I have at least done this. I realized at the beginning that no market adviser, even if he had all the wisdom of a Solomon, if he had all the powers of action of a Napoleon and all the philosophy of a Socrates, could undertake to solve the marketing problems of 100,000 or more separate, individual farmers. It can not be done. I realized at once that to be of any service to the producers, the first thing to do was to organize them into marketing associations. Individually the farmer is helpless to better his marketing conditions; collectively he can do wonders.

As a result of the campaign carried on during the past year, never before in the history of the commonwealth was there so much activity along the lines of cooperative undertakings as at this hour. There are now cooperative movements going on in every part of the state, among the prune growers, the apple growers, the milk producers, and so on down the line. When California will be as I hope it shall be, the best organized farmer state in the Union, we will have made great strides along the lines of bettering the marketing conditions in the interest of producer and consumer. That is the work to which I have dedicated myself.

My friend, Mr. Nagle, has said many things. I am glad that an opportunity was afforded him through this medium to tell the growers what his organization performs. He has, however, given a twist to the discussion. I believe he has intended to be fair, but he has given a twist to the discussion that would make it appear that I am an opponent to the Citrus Growers' Exchange and to the Fruit Growers' Exchange. Nothing of the sort. How consistent would it be for me to be opposed to those two organizations, which are cooperative associations? I am not here opposing the Exchange. I am here simply pointing out that so far as this question of distribution is concerned, Mr. Nagle has got a kink in his mind. All I am trying to do is to straighten out that kink. He has told us a great many interesting things, but he can not get away from the facts and they are here on this chart now staring you in the face. He has not answered those facts. Our friend, Mr. Swett, put the question to him, "What is your remedy? How are you going to prevent a repetition of this condition?" and his only answer was. "Let the whole 100 per cent of the growers come into the Exchange."

Let me tell you this my friends. that despite the fact that I have been spending my days and my nights traveling over the state of California. from Eureka down to the border line, no man has ever heard me advocate that 100 per cent of the growers should come into any one organization. I have never advised that there should be more than 70 or 75 per cent, and why? Because 100 per cent of the growers would spell monopoly and I am "agin" monopoly. I do not believe there is any human being who is fit to be a monopolist. because monopoly brings out of us our very worst and kills our very best. I should regard it a misfortune if I were to be placed in the position of a monopolist.

Place 100 per cent of the growers under the direction of Mr. Nagle, however efficient he may be today. and he will become big and fat and lazy and you will get the least out of him.

If I had been listening here as an uninformed grower, I would have been led to believe by Mr. Nagle's statements that the state intended to take hold of every man's business and manage it. The state doesn't propose to do anything of the sort. One would further imagine from what he has said, that I, as State Market Director, intend to take the proposed State Bureau of Distribution and do the distributing myself. Happily, I anticipated Mr. Nagle in my previous remarks with the statement that I did not know the first thing about distribution and that the details would be handled by a group of five distributors chosen from among the distributors themselves and that they would select as the head of that bureau the best man they could find. The burden of cost for maintaining the bureau would not be on the state. but where it belongs, where it is carried in the Imperial Valley, on the industry itself. and the burden would be so light that nobody would feel it. That loss of practically $10.000 in one day on the sale of pears in New York as shown on the chart now before you would practically cover the expense of the whole thing for a season. A banker in San Francisco might say that he would not join the San Francisco clearing house because the clearing house might interfere with his business. The bank clearing houses in San Francisco and in Los Angeles are established to eliminate waste and to expedite business. not to tell the bankers how to make a profit. and this would be the only purpose of the fruit bureau of information. To carry out the plan you must have 100 per cent of the shipments and you can safely have 100 per cent for the purpose of distribution pure and simple. because you are not controlling prices but simply giving information.

THE NEW PEACH GROWERS ORGANIZATION, AND WHAT IT MEANS TO THE PEACH GROWERS.

By J. C. Rorden, Selma, Cal.

You have heard the splendid oration of Mr. Weinstock, our State Market Director, who has just finished his discourse. Now, if you will bear with me a little while, I will try to give you some of my experiences that I have had in raising peaches in and near Selma. It has been a sort of a "Knocks" College education to me and I am still a pupil, for it seems to me that there are new things coming up to the peach grower all the time.

Yes, I am from Selma, the Home of the Peach, a prosperous little city south of Fresno about fifteen miles. It is surrounded by splendid peach orchards, vineyards and alfalfa. Selma was christened the "Home of the Peach" about twelve or fifteen years ago and if you take a trip down through the San Joaquin Valley on the Southern Pacific Railroad, when the conductor calls "Selma" look through the window and you will see Selma's slogan in an electric sign, "Selma, the Home of the Peach." Less than a year ago they threw a good many slurs at that sign. They said that the reason Selma was the Home of the Peach was because we could not get rid of our peaches and they therefore stayed at home. My answer to them was that our slogan had reference to Selma's young ladies.

But things have changed in the last year. While the prices a year ago were 2¼ and 2½ cents, they are now up to 6 cents and the reason for the difference I will refer to later.

Besides receiving in the neighborhood of 3,000 tons of dried peaches in Selma this season, we have shipped out several hundred car loads of green peaches. The Libby, McNeill & Libby cannery cans about 6,000 tons of peaches in a season. It averages 125 tons a day and employs between 500 and 600 men and women. The plant is going to be enlarged so that it can take care of 200 tons a day. It will then be the largest peach canning establishment in the world and will give employment to 800 people during the canning season.

Now, to get a peach orchard, the first thing necessary is to have a good piece of land and it is necessary to pay in round numbers $100 an acre down our way. After making some very careful estimates and consulting with other large peach growers, I have arranged a table of figures which will give you a good idea of what it costs per acre to get a peach orchard into bearing.

First Year.	
Cost of land per acre	$100 00
108 trees, 15 cents each	16 20
Planting	7 50
Plowing once	2 00
Plowing twice	2 50
Harrowing three times	1 50
Cultivating two times	1 00
Irrigating three times	3 00
Water for irrigation	75
Taxes	1 00
	$135 45
8 per cent interest on $100	8 00
	$143 45

Second Year.	
Pruning	$2 00
Planting and resetting	2 50
Spraying	1 50
Plowing two times	3 25
Sulphur	1 25
Harrowing two times	1 00
Cultivating three times	1 50
Irrigating three times	2 00
Water for irrigation	75
Taxes	1 00
	$16 75
8 per cent interest on $143.45	11 45
	$28 20

Third Year.

Pruning	$2 50
Spraying two times	2 50
Plowing two times	3 25
Harrowing	1 00
Cultivating	1 50
Sulphuring	50
Irrigation	2 00
Digging around trees	1 00
Water for irrigation	75
Taxes	1 00
	$16 00
Interest on $171.65	13 75
	$29 75

Fourth Year.

Caring for	$16 00
Curing	20 00
200 trays	25 00
5 sweat boxes	3 50
10 picking boxes	1 60
Sulphuring	12 00
	$62 10

One-half ton peaches produced, $50.00.

Fifth Year.

Caring for	$20 00
Sulphur	24 00
200 trays	25 00
5 sweat boxes	3 50
10 picking boxes	1 60
Curing	40 00
	$94 10

One ton peaches produced, $100.00.

We now have an orchard five years old and in bearing. The next thing is to dispose of the produce of the orchard and through the efforts of the California Peach Growers, we have found that medium.

Some three or four years ago there was a cured fruit exchange organized and we had quite a meeting at that time in Selma and they selected five of us to go to Sacramento and investigate their proposition. There were four of us went up there but we could not see our way clear to join it. The trouble was that they were buying on the same market without any money and selling on the market with the packers. The packer goes out and pays you cash and the exchange agreed to pay what they could possibly get out of the peaches when sold and it was something on the order of the Farmers Union. When a farmer delivers his peaches he has to have the money for them for it costs money to raise and cure them. If you can not pay him the cash, he has to go where he can get it.

A year ago the twenty-second of last August there were about fifteen or twenty men met in the Chamber of Commerce building in Fresno and after one or two hours' deliberation a committee was appointed to go and see the California Associated Raisin Company and ask them if they would not consider taking over and marketing the peaches the same as the raisins were being marketed at that time. I was selected as one of the committeemen and there being a full board of the raisin company in session that afternoon, we conferred with them for several hours and finally they told us that it was impossible for them to take the responsibility of marketing the peaches that belonged at that time to the different farmers all over the San Joaquin, Santa Clara and Sacramento valleys, and they turned the proposition down. We adjourned to the Chamber of Commerce building again and passed a resolution that we would form a peach growers organization and use the raisin association as a model. We selected William Glass as our president, J. P. Bolton, our secretary, T. B. McKelvy, of Clovis, I. Tielman of Fresno and myself from Selma, as directors. It looked that afternoon like a hopeless task to go out and gather in all the peaches and a million dollars to help pay for them without a single cent. All the stock that was in store at that afternoon meeting was courage, determination and ambition. But, in everyday language, "we tackled the job."

This was on the twenty-second day of August, 1915. We agreed to have $250,000 subscribed by the first day of January, 1916. . You know it was necessary for us to have the money first. If we did not get that amount by January 1, the subscriptions that we had received up to that time would have been null and void. We adopted a plan to go to the different schoolhouses in the county, generally in pairs, sometimes we would all go together, but as our time was limited, we usually went by twos or once in a while singlehanded.

Our argument at those meetings would be, the deplorable condition that the peach market was in at that time could be overcome by all of the farmers joining in and subscribing $20 an acre, one-fourth to be paid on the call of the board of directors and one-fourth annually thereafter, for we had figured that by getting $20 an acre, we would get our million dollars and with that amount we could finance the corporation. At the close of the meetings, we were generally successful in getting all of the farmers present to subscribe and appointed someone to take charge of their district and add to the subscriptions. We struggled along until we had $100,000 or more subscribed and it seemed like a good many of the big growers would not join with us. At that time even the banks gave us the glassy eye and thought that we would not make a success of it. At one time, I myself, felt very dubious after I had been talking with the president of the raisin association, who is a very close friend of mine and who knew that I had worked so hard with the raisin company to make it a success. I knew my plea had considerable weight with him, but he told me that if we had in our contract that we would agree not to do business until we had $600,000 subscribed and at least 75 per cent of the acreage signed up he would then subscribe $2,500. I told him that that was our full intention and though it was not in the contract at that time, it would be after we got our $250,000. Well, he said, "John, I am ready and willing to go with you then." After that interview with Mr. Giffen, I went over to our president, Mr. Glass, who by the way is one of the best men in Fresno County for having the welfare of the county and community at large at heart. I related to him what Wiley Giffen had told me and I said "Glass, hadn't we better do that? I am willing to have that $100,000 re-subscribed which we now have on our list." He said "John, we won't do it. If we make that change, we will have to change for somebody else in some other manner and we will never get anywhere. We are going to put this thing through and there is no stop." I worried about it for a day or so and in the meantime kept going around to the schoolhouses every night, gathering up more money, getting more help and finally it looked to me like a big snowball rolling down hill. We gathered more volume, thereby getting more strength and more courage and when the first day of January came, we had something like $330,000 subscribed.

We selected twenty-five trustees from different parts of the valley and with their aid we gained more strength and finally formed our organization on May 1, 1916. We then elected our present manager. Mr. Niswander, got some paid solicitors and have at the present time $850,000 subscribed and between 85 and 90 per cent of the acreage signed up. For the signing up of the acreage we set a certain day on which workers all over the state solicited for the new peach growers organization and I do not think it took more than four days to sign up 60 per cent.

Up to that time there had been very little money spent in getting the organization together. There had not been any money spent until May 1 when we had our election of officers, except that spent by the "four goats" as I used to call them. I might state right here that it took some nerve to tackle this job, but thank heaven, we have made a success of it.

Formerly a little bunch of packers would get together and have a big feast—I think they had their last meeting at Del Monte. They spent a ten days' vacation over there and set the prices before the blooms were on the trees and then came back home and told us farmers what we could expect to receive for our peaches the next year. You could not blame the packers—it was the system that was wrong. They were doing the gambling, the farmers were doing the irrigating, plowing and cultivating. At the end of the season they had both done their work but the farmer would come out at the little end of the horn. Now, see the difference. The farmer brings in his peaches to the warehouse, he is given a check for 70 per cent cash and gets a note for 30 per cent that he can cash at any bank, or in other words, he gets $100 a ton on delivery. He then gets all the balance excepting the expenses, a little interest that is paid to the stockholders for furnishing the money. The Eastern buyer does not pay as much for his fruit as he has done in years gone by, merely because the gamble has been taken out of the peach game. Our packers got so the last two or three years that they were afraid of each other and I do not suppose they even had any meetings because they could not agree on anything, therefore our peaches went so low that the farmer could not raise them for the price offered. As I have shown you in my table of figures it takes in the neighborhood of $50 a ton to get peaches ready for the market and the packers were offering that for them when we started in to organize our company.

After the farmers had signed up their acreage and we had notes and money to the amount of about $800,000 there were still some who said we could not make a success of it, they thought we would not be able to finance it. It looked sometimes to us that to have in the neighborhood of 20,000 tons of peaches delivered to us for which we agreed to pay $2,000,000, our $800,000 in notes would hardly hold out, but we had the confidence of the bankers, who wrote us from different points in the state that they would go the limit with us, and that was some encouragement to work on. I want to state right now that the peaches are in the warehouses, the obligations have been met and we are now on a firm footing, our worry is over and the Peach Association is a howling success.

That is not all. We expected to sell something like 5,000 tons during October delivery, and we had figured on that amount to help pay for the peaches as they were brought in. Instead of 5,000 tons, we have more than doubled that amount. We expected that the crop would be in the neighborhood of 30,000 tons, and we find that it has fallen short. We expected to take care of something like 22,500 tons (our percentage of the whole crop) and we find that we overestimated that amount. Instead of peaches going slow and being a drag on the market, they are in big demand.

In our little talks that we made in the schoolhouses, I used to tell them, "If you want to do your farming on business principles, you must do as the groceryman does, put up some money for your goods. Now, if you put up the money, when you bring your peaches into the warehouse, we will pay you for them. In other words, you must finance your own business," and we got them to sign up and everybody down there is now happy.

THE ALMOND GROWERS' EXCHANGE.

By Geo. W. Pierce, Davis, Cal.

I can assure you this is entirely an impromptu talk, and what I say to you on the spur of the moment will be something about cooperation among almond growers. Previous to the year 1906 there was no general organization of almond growers in the state of California. The first almond association formed anywhere in the state was at Davis in the year 1898. I had the honor to be one of the officers of that association at that time and I have continued so ever since. That was the beginning of the organization of almond growers in California. Previous to that we had been selling almonds at a price that was ruinous. Generally we received about 8 or 9 cents per pound, and those of you who understand anything about almond production, realize that we couldn't maintain the business under those conditions. We organized that trial association at Davis. We invited bids from the commission men and brokers who handled the almonds of those days, and we had what was seemingly some little competition among the buyers, but it was only a seeming competition. Naturally we, as a lot of farmers, did not understand the business of inviting bids. We were easily imposed upon. The matter was all fixed before the bidders came to us and they gave us just what they saw fit and afterwards divided the crop among themselves. That ran along for a year or two and we began to branch out. We went over into Brentwood in Contra Costa County and induced some growers there to organize. We then went into Sutter County and induced the Sutter County people to organize. We tried to cooperate with these organizations, but it was not much of a success. We had no means of getting together on a selling basis. We had then the same trouble you are having now in all the cooperative organizations which you are trying. A little later, in 1906, a general movement was taken up along the line of almond work and those organizations—there were six of them then, having 231 members—joined into a state association known as the California Almond Growers' Exchange.

That year we set the price, the first time that the almond growers of California ever set a price, and that price, as I recall it, was about 14½ cents for Nonpareil. It was predicted we could not get it and for months it looked as though we couldn't get it. We held those almonds over, and it was not an easy thing to do when we had no credit with the banks and no commercial standing anywhere. We had nothing but almonds and a determination to succeed. We stayed with the proposition and it was very nearly a year before we succeeded in selling the last of that crop and getting our money, but, as the gentleman said on the floor here this afternoon, we did it. We succeeded in getting the price that we had originally set as the equitable price for the growers of the state of California. We here scored our first victory.

We have been going on from that time until this, until now we have twenty organizations; twenty associations in the different almond-growing sections of California. The most northerly one is in Tehama County and the extreme southerly one is in San Bernardino County, at Banning. The almond-growing business has increased very rapidly. We have seen the tonnage grow from about 1,000 tons to 3,500 or 4,000 tons. Less than one-half the total planting of almonds in California is now in bearing. We anticipate that in the next five years we will have possibly 10,000 tons of almonds to dispose of. That is a great many almonds. It is a great many almonds for a cooperative organization to undertake to handle.

Almonds are a luxury. We all understand that. You and I can stop for a moment and see how few we consume in our own several households, and we realize that when we have 10,000 tons to dispose of in competition with four times that amount coming here from Europe, we must do something besides produce almonds. We must know how to *dispose of* these almonds. Each year we have endeavored to post ourselves as best we could on foreign conditions. We have undertaken to find out what they are doing in Europe, and whether or not they are extending the area devoted to almonds. We are trying to find out how they succeed in producing their output with so little expense as they do. We are trying to find out how it will be possible for us to get together and, by better methods, produce a better almond at less cost. This has been the work of our association, and when I tell you that when we began this work there were no distributing points outside of the great commercial centers in the east, and that today the great bulk of the California almonds are being sold in small towns throughout the country, you will learn that we have been endeavoring to create a market. We are selling almonds in carload lots in cities of not greater population than 10,000. Ten years ago there was nothing of that kind known. A town of 10,000 population ten years ago, if they bought any almonds at all, bought perhaps from one to five bags. That supplied their trade.

We have endeavored to encourage the consumption of almonds by introducing new methods, and we have found, as we entered this work and kept it up, that our chief competitor, who is the Spanish almond grower, has a different method of marketing his almonds from that employed in California. We of California today are supplying nearly all of the Eastern market with almonds in the shell—almonds as you see them here in your market. Ninety-five per cent of the almonds of Europe that are brought to this country are shelled almonds. Those are sold to the confectioner and to the baker. There is a sale for them the year around. The almonds in the shell are very largely used about the holiday times, and we of California have just about supplied that market. So it is up to us to find some means of disposing of the great quantity of almonds which we know is coming to us and that we must handle. For that reason, in addition to exploiting the markets, and in addition to distributing throughout centers that have never before had them, we have undertaken the almond-shelling business. We have established in Sacramento a nut-shelling plant, the largest of its kind on the continent. I am telling you nothing new when I say that California is the only state in the Union that produces almonds commercially. We are operating in an untried field. We have bought land in Sacramento and have installed the best machinery obtainable. We have employed experts, not alone to build, but to create and invent machinery for the handling of shelled almonds. We are still handicapped, however. There is one almond that is brought to America and is sold here at the highest price paid for any almond, viz., the Jordan. That market we are unable to compete in, for this reason: We can not successfully crack the Jordan almond. Now, that seems singular. The inventive genius of Americans along that line has not yet been able to cope with the problem of cracking a Jordan almond without damage to the kernel. We have tried to ascertain how it is done in Spain, but it is one of those trade secrets that we have not yet learned. We are going to send an expert to the Mediterranean, and we are going to keep him there until he learns that secret, or until he dies. When he comes back here, we, of California, will be in the Jordan almond business. There is no reason why we should be selling an almond at 35 or 40 cents a pound, and letting the cream of the market go to the Europeans, at seventy-five cents and a dollar a pound. We purpose getting our share of that business. We are going to do this through cooperation. We can not do it in any other possible way. Today we have nearly 1,200 growers and they are as a unit in all this work. We have never gone to our representatives from the various associations who come to us direct from the people, and asked them for anything in the way of funds for improvements or developments that they have not met us more than half way, and wondered why we haven't asked for it before.

Now, these are some of the things made possible by cooperation. We believe that we can handle all the almonds that California can produce. Previous to our organization there was a firm in Paso Robles that twenty years ago had an almond orchard, but for two years they were unable to sell their crops at all, and they tore down the fences and let the stock in. We were producing about 1,000 tons of almonds at that time, and there was no market for them.

I was down at Lancaster in the Mojave Desert not long ago and I saw a large almond orchard there, and alongside it some almond trees that had been planted within the last year, and I said, "I see you are going into the business more extensively." The grower replied, "Yes, we are returning to it. Do you see that eighty acres of 'cots? That was all almond orchard once and I took them up." "Why," I said, "did you take them up?" He answered it was because he couldn't sell the crop. "I kept those almonds two years and couldn't sell them, but I joined the association about three or four years ago and now we are putting out almonds again." Growers are doing the same thing all over the state, because they know almonds can be sold. We have learned how. We have employed the most expert salesmen. We have established a selling agency which we are satisfied can handle all we can produce, and handle them at a profit to the growers. If our cooperative selling agency were out of this business for one year, you would see us all offering almonds at a price that would spell ruin.

We haven't all the growers. Someone has said, "If you can do so much why is it that you have but 75 per cent of the producers?" Well, it is the same reason that all the other associations do not have them all. It is perhaps best that we don't get them all. We might become monopolists. We are not trying to set extravagant figures. We are trying to prevent speculation and extortion in the marketing of California almonds. We are keeping pace with supply and demand and we are going to get a good figure when we can, but we are not going to set the price so high that it will be either burdensome or prohibitive.

THE CALIFORNIA FARMER AND THE COLLEGE OF AGRICULTURE.

By Thomas Forsyth Hunt, Dean of the College of Agriculture, University of California, Berkeley, Cal.

Mr. Weldon asked me to give an address here tonight on the College of Agriculture and the California farmer. This I declined to do, but I agreed to talk about the California farmer and the College of Agriculture. It seemed to me that the California farmer was primary and the College of Agriculture was simply secondary.

It is not the purpose to expound any thesis, to uphold any principle or urge any program. If, perchance, any suggestions are made, they are such as grow out of the data presented. In other words, the data here presented are for the purpose of giving some facts, or "near facts" about the California farmer; to gain, if possible, a true picture of him and of his conditions. If, out of the facts certain conclusions are reached, this is not because data were collected to support such conclusions, but rather that the conclusions follow because of the conditions found to exist.

I say "near facts" because, in order to give you a picture of the California farmer one must resort to statistics. Someone has said that there are three kinds of lies, *i.e.*, lies, blank lies, and statistics. Anent statistics, our well-known friend, Edward Berwick, at a meeting where the prohibition amendments were being discussed, related the following Limerick:

"There was a young lady from Skye,
With a shape like a capital 'I';
She said it's too bad, but then I can pad;
Which shows you how figures can lie."

Edward Everett Hale properly expressed it, when referring to the saying that figures never lie, when he said that the fact was that figures never tell the truth. This thought deserves some emphasis. Statistics must not be taken too literally. It must be recognized that they are subject to various interpretations. Figures, instead of giving actual facts, generally give the near facts. One of the difficulties with figures is that they deal largely with averages. It is impossible to speak of the average California farmer. There is no such individual.

The California farmer is like the California weather. We have not known about him long enough to establish a normal. I once asked a man the life of a Baldwin apple tree in New York State. He said they did not know; they had not had Baldwin apple trees long enough to find out. The oldest trees they had were only about 100 years old. There is no such thing in California as usual weather or the usual farmer. It, he, or she, is always unusual.

I am frequently asked whether the average farmer does not do so and so? I always reply that there are all kinds of farmers, just as there are all kinds of preachers, doctors, storekeepers, manufacturers and teachers. The farmer is not a race. He is not even a class. Often he has a brother who is a storekeeper, and a sister who has married a lawyer. Some farmers are ignorant, others are among the best-read men of our times. Some are lazy and shiftless, others are energetic and thrifty. Some make money and spend it, others make money and save it. Most farmers simply make a living, which is all that most other people do. A farmer generally makes wages and a small interest on the capital invested.

The farmer himself is to blame for the fact that his farm earns only a small interest on the investment plus wages. If the farmer buys a farm at $50 an acre, and the farm nets him wages and 6 per cent in addition, he immediately asks $150 an acre for it, and would not sell it for less than $100, after which he may complain that farming no longer pays. The high price of land is an indication that farming does pay. The lower the interest on railroad stocks or bonds, the safer the investment is deemed to be. Government and municipal bonds bear a lower rate of interest than do railroad and industrial bonds, because of the greater certainty of payment of principal and interest. Too high a capitalization may prevent land from being put to a productive use. Some lands in California are not put to productive use because they are capitalized at too high a figure.

In 1910 the total number of persons in California over ten years of age, engaged in gainful occupations, was 1,107,668. There were 225,070 persons engaged in agriculture, forestry, and animal husbandry. There were approximately 1,200 architects, 2,000 dentists, 3,000 clergymen, 5,000 lawyers, 5,000 physicians, and 10,000 real estate agents. In the United States as a whole, about one-third of the persons over ten years of age engaged in gainful occupations were engaged in agriculture, while in California only one-fifth of the workers were so occupied.

So far as the number of persons is concerned, therefore, farming is not overdone in California. Relatively speaking it is not a crowded occupation. If this paper were to have a thesis it would be that farming in California is not overdone. The California farmer has a future.

One of the high school boys who went on the transcontinental trip and who had never before been outside of his local community, was asked, after he had seen New York with its 50 and 60-story buildings, how it all impressed him. "Well," he said, "You know I saw the Hobart and Spreckels buildings in San Francisco. I thought they were pretty high. After that it did not matter how high you made them."

It is really very difficult to make comparisons, because to the average mind there is no particular difference between four millions and two billions. Judgment, however, is based upon comparisons. Therefore, in order to understand the California farmer he must be compared with other farmers, even at the risk of giving offense to one or the other. Unless you are willing to accept the unfavorable along with the favorable, no correct judgment can be reached.

It so happens that there are four tracts of land of approximately equal size, and characterized by four rather distinct types of agriculture, which are admirably adapted to comparative uses. Doubtless other areas might have been chosen, but one must draw the line somewhere. These four tracts are: (1) The nine North Atlantic states; the six New England states, plus New York, Pennsylvania and New Jersey, the grass and trees states. (2) The three corn states, Indiana, Illinois, and Iowa. (3) The two Dakotas of spring wheat fame. (4) California, the land of fruit and flowers.

The agriculture of the nine North Atlantic states is based on pasture, timothy hay, and apples. The agriculture of the three "I's" (Indiana, Illinois and Iowa), is characterized by corn and hogs; that of the two Dakotas by wheat and cattle; while the foundations of California agriculture are laid in barley, alfalfa and fruits.

These four areas are approximately equal in size, but very different in population. The nine North Atlantic states contain twenty-five millions of people, California two and a half millions; the three corn states contain a population four times that of California, while the two Dakotas contain only one-half its population.

The value of all crops and the value of all animals owned on farms according to the census of 1910 was greatest in the corn states and least in California. The North Atlantic states are characterized by the products of their manufacturing, while the Dakotas are characterized by their lack of manufactures. The per capita value of all crops raised and animals owned on farms in the North Atlantic states is far less, and manufactures somewhat more than in the other sections, while in the Dakotas the value of crops and animals is far greater per capita, and that of manufactures very much less.

After all has been said about things being unusual in California it seems strange to relate that the per capita value of all crops raised and all animals owned on farms, and all manufactured products, was in 1910 almost identical with the average of the whole United States. Whatever may be said of individual localities or particular individuals, California as a whole is distressingly normal. From the standpoint of society California was in a satisfactory condition in 1910. I wish to repeat that I did not start out to prove it to be true. It just happens to be so. If, however, one is not considering society, or even the agriculture of the state as a whole, but is interested for the moment primarily in the status of the individual farmer, the situation will be found to be somewhat different. The average value per farm of the crops raised and animals owned on farms in California was approximately twice as great as for the average of the United States. However, in both these particulars the two Dakotas outrank every other section.

It is also obvious that we have a very good opinion of our farm lands in California. We value them highly, perhaps in more senses than one. Speaking generally, the farmers of the United States demand a greater return from their crops for the capital invested than do the farmers of California. For the United States as a whole the crop return in 1909 was a little more than 13 per cent, while for California it was less than 10 per cent. However, the return per farmer was much greater in California, since the capital invested per farm was nearly three times as great.

I think we may lay it down as a principle that in the long run farms will pay the least on the capital invested where people obtain the greatest satisfaction from other things than the money they make. A farmer living in Napa valley would require a considerable additional financial inducement to cause him to move to Bolivia or Manchuria. Whether the higher capitalization is due in this instance to the satisfaction of the California farmer with his environment, or due to the 10,000 promoters who are abroad, is no part of this paper to consider.

The California farmer is about one-fourth native Californian; about one-fourth New Englander by a process of steps; one-fourth foreign born; while the other one-fourth is a mixture of all three of these elements. (Speaking of New Englanders, it was President Wheeler who said, while attending an Iowa Day in California, that the people of that community had come to California from New England after sojourning a while in Iowa.) The foreign blend is English, German, Italian, Mexican, Scandinavian, Portugese, French, Austrian and Russian, chiefly. Perhaps there are few states whose farmers are more cosmopolitan, or perhaps, I should say more diverse and complex.

Since this paper deals primarily with the California farmer rather than with California agriculture, this diversity of population is perhaps one of its most important aspects. Certain it is that it presents one of the most important factors in the attempt of the College of Agriculture to serve the California farmer. There are, for example, often great social difficulties in bringing together into one meeting, as a grange or farmers' institute or farm bureau, a group of native-born Californians, descendants from Anglo Saxon ancestry, and a group of foreign-born farmers of some single race and community interest. It is a real problem in California. It is one that must be faced squarely. The College of Agriculture can not have stepchildren.

Not only is there a segregation by racial, social and religious instincts, but there is a segregation of interest due to crop specialization, which is carried to a greater degree in California than in any other part of the United States—perhaps in any other part of the world. When in the Eastern states one speaks of a farmer he at once has a mental picture of a man who raises corn, potatoes, wheat, oats, hay, vegetables, and fruits, and who owns cattle, hogs, sheep, horses and poultry. In California a farmer raises poultry, and has a Ford; he raises grapes and keeps a Dodge, or he raises prunes and has an Overland, oranges and a Cadillac, or lemons and a Franklin. He gets his income from the one and gives his care and attention to the other.

To one of these prosperous farmers, wheat, oats, hay, hogs and sheep, sometimes even cattle, are things in which he usually has no business interest; does not wish or need to spend an afternoon or an evening listening to a prosy discussion on their care or cultivation. In New York, Illinois or Kansas a few topics can be announced at a state-wide meeting like the present one, which will be of interest to the farmers from the four corners of the state. Only a few producers in California, relatively speaking, have a business interest in the subjects discussed at this meeting. In California if a man is a walnut grower he does not wish to discuss animals; if he is an avocado enthusiast he wants the latest information upon the varieties, budding, cultivation and distribution of this fruit. The growers of Japanese persimmons ask for complete information as to the regions, varieties and cultural methods. After him comes the man who grows nothing but cantaloupes, who asks for a method of determining the percentage of sugar in the melon without sampling it.

Speaking in general terms, one-fourth of the farms of California were less than 20 acres in area, one-fourth between 20 and 49 acres, one-fourth between 50 and 174 acres, while the remainder were 175 acres or more in extent in 1910. The latter one-fourth occupied seven-eighths of the total area in farms. The average size of a farm was 317 acres, with an average value for land and buildings of $16,447. The average value of live stock per farm was $1,447, and that of implements and machinery was $414.

Just as a man who has a mortgage on his farm needs a larger farm than the man who owns a farm which is free from debt, so the renter needs a larger farm than the man who owns his farm, because he must not only make a living for his own family but also in part or in whole a living for the family of the owner. Of the 88,000 farms in California 66,000, or almost exactly three-fourths were operated by the owners, 18,000 by tenants, and between 3,000 and 4,000 by managers. In the past 30 years there had been no material change in the proportion of tenants to farm owners.

The California farmer, for the most part, raises products worth more than five cents a pound, or a product such as fresh fruit that has considerable water in it. If the farmers' finished product does not fall into one or the other of these classes he finds, or is apt to find, eventually, either economic difficulties or soil depletion. The exceptions are so few that if a man is engaged in any other type of farming he will do well to study his situation carefully.

The average farm owner in California lives on a farm of 227 acres, worth about $12,000, on which there is a mortgage of about $3,000. The farm owner's equity in his farm in 1910 was about $9,000. This represents a satisfactory condition of affairs. The only way that the average young man can secure title to a farm is by going in debt for it. The fact that men have been continually going in debt for farms, and through this process are becoming farm owners, is a most gratifying fact. Now that the Homestead Act is no longer a potent force in enabling young men to become farm owners, the problem of land settlement has assumed a serious aspect and one that must be faced bravely, although its proper solution may look like a revolutionary step to many.

Unfortunately, the California farmer's income has never been determined. There is reason to believe that the crops he raises would bring him from $1,500 to $2,000 if they were all sold, of which one-third comes from fruits and nuts of various kinds. He probably keeps 20 head of cattle, 6 horses, 9 hogs, 20 sheep, and 60 fowls. There is reason to believe that the farmer sells annually $500 to $600 worth of animals and animal products, including butter, cheese, eggs, honey and wool. How much of his crops were consumed in producing these animals and animal products has never been determined.

Since we have now wandered into the speculative realm and are no longer guided or limited by statistics, it may be said that this California farmer owning and operating his own farm, worth $12,000, in which he has an equity of $9,000, receives a gross income in the neighborhood of $2,000 per year. The upper one-fifth of this group probably has an income of $3,000, from which it follows that another one-fifth obtains probably only $1,000 worth of salable products. If this farmer living on 227 acres, and having a gross income of $2,000, has a family which enables him to do his work without outside help, it is probable that he spends $250 on interest, $750 on expenses, and has $1,000 for living expenses and reduction of his mortgage. If a farmer of the upper one-fifth has $2,000 for such purposes, a farmer of the lower one-fifth probably has nothing for this purpose. The only way that he can live is by not paying his interest. If the farm of a farmer of the upper one-fifth increases in value on account of its higher income, which is likely to happen, the owner becomes a leading citizen, his name is good at the bank. If the farm of the man in the lower one-fifth decreases in value because of the small income, he has difficulties, his credit is not good at the grocery store.

Of course there are few such individuals as I have described, because of the great complexity of specialization of agriculture in California. Furthermore, it must be understood that this discussion is based upon data gathered six or seven years ago. Any one who goes about this state and observes the dwellings in the country and town alike, can not help but be struck by the large number of houses that have been erected in the last six or seven years. What all this will mean to the next census is perhaps not safe to conjecture.

As remarked by Dr. Allen of the U. S. Department of Agriculture, at Washington, the function of the farmer is to raise things. It is the function of the College of Agriculture, through its experiments, to minimize and stabilize the risk. It is not a responsibility to be taken lightly. The most superficial list of cultivated plants and domesticated animals in California bears 160 names. If all of the flowers and seeds that are grown on a commercial scale were added, the list might be largely extended. The fact that farmers in California are specialists adds still further to the difficulties. Mr. Green remarked one day that he did not know where the money would have come from, but that he had offered Mr. Brown $1,000,000 for a portion of his orange groves, and Mr. Brown had declined the offer. It is quite necessary for the College of Agriculture to be sure of its ground before offering advice to Mr. Brown.

When to this variety of forms with their multiplicity of methods of propagation are added the variations of soil, climate and marketing, the difficulties become somewhat appalling. However, the fact that these difficulties exist is the real reason for the maintenance of the College of Agriculture and Agricultural Experiment Station, with its staff of teachers and investigators. If the discovery of fundamental laws was not a serious business, and the accurate statement of agricultural knowledge important to the progress of the state, then the College of Agriculture would not be necessary.

It is not important, therefore, to dwell upon the difficulties, as that is not so much a public question as it is a matter of internal administration. It is of the greatest importance, however, that the true functions of the College of Agriculture and Agricultural Experiment Station be clearly comprehended. Bills introduced into the last state legislature aiming to place upon the director of the Agricultural Experiment Station of the University duties and responsibilities foreign to the true function of the station, is only one of the reasons for referring to this subject.

It seems that a great many people do not distinguish between a good thing and the College of Agriculture. Perfectly well-meaning suggestions are constantly being made that this or that duty be placed upon the College of Agriculture, duties that certainly should be performed by some one, but which are no part of the function of the College of Agriculture or the Agricultural Experiment Station.

The function of the Department of Agriculture of the University of California is "the creation and diffusion of knowledge" relating to agriculture. It aims to discover and instruct, but not to control or direct any person's actions. It aims to point out to its constituents the opportunities which the agriculture of California offers, and to teach them how to take advantage of those opportunities. It is not the function of the Department of Agriculture to conduct or to interfere in any way with their business.

As a concrete example, take the problem of marketing farm products. The Agricultural Experiment Station may properly seek to discover better methods of packing and standardizing farm products and better ways of transporting those products to the consumer; may study methods of attracting consumers to California products; may seek to discover additional markets so that the farmer may have an opportunity of selling in more than one market, and may study to improve the distribution of products among accessible markets so as to prevent an oversupply of products or an undersupply in given places. It is not its function to take part in the selling of farm products.

In the counties having the farm bureau system the farm adviser is constantly searching for new markets and new methods of marketing. He keeps a card catalogue of members who have farm products for sale, or who desire to purchase them. When it is found that one member has an article for sale and another wishes to buy a similar article, both members are notified. This closes the incident so far as the university's officer is concerned. The members of the farm bureau must deal between themselves. The farm adviser gives both parties all the information he has, but he can not transact the sale or take any responsibility concerning it. If the members of the bureau desire to organize a selling or purchasing association, it is the duty of the farm adviser to give them such information and counsel as he is capable of giving, advising for or against such an association as circumstances may dictate. He can not act as agent of any such commercial organization nor accept directly or indirectly any responsibility for its transactions. The station will show a farmer how to spray his trees, how to inoculate his hogs against cholera, or how to map the soil on his farm. Having received the necessary information, the owner must proceed to perform the operations, or employ some one to do it. if the work is to be done. In other words, as soon as the transaction becomes commercial the station's relation to it ceases.

In California four functions of government are recognized, *i.e.*, the executive, legislative, judicial, and the educational, which latter includes research. That is to say, it is a government function to acquire and diffuse knowledge. The university and public schools are the agents for acquiring and inculcating this knowledge. Logically, therefore, it is not the function of the university to execute the laws of the state. However, the director of the Agricultural Experiment Station is charged with police functions in the case of the control and sale of fertilizers and insecticides, and in the production of anti hog-cholera serum, virus and other antitoxins. While the necessary analyses and expert advice concerning matters of this kind should emanate from the station, the execution of the law should obviously be in the hands of an agent directly responsible to the chief executive of the state.

There are many reasons why the station should not be charged with the responsibility for the execution of laws. But the most fundamental one is that all members of the station staff should remain unbiased. They should not be placed in the attitude of an advocate nor have any interest in a decision, beyond stating the scientific truth. In this connection it is strongly urged that a law should be passed exempting members of the station staff from being called into court to give expert testimony in case of litigation between private interests.

There is, therefore, a capital distinction between performing executive and police functions and that of having the scientific knowledge upon which the executive and police powers can act wisely. The College of Agriculture should, and is ready at all times to assist those agencies whose duty it is to execute the laws. Thus it has served many state boards, such as the State Board of Control, State Civil Service Commission, State Reclamation Board, State Commission on Housing and Immigration, and Market Director. The College of Agriculture takes the ground that while it should not attempt to execute the laws of the state it should assist every public agency which desires it with expert information.

The North Atlantic states and the three corn states had in 1910, 600,000 to 700,000 farmers. California had less than 100,000. Will California some day have an equal number? The North Atlantic states had seven times as many farmers and ten times as many people. The three corn states had about eight times as many farms and about four times as many people.

Human beings are the most important factor where human activities are concerned. Why do the North Atlantic states, with an area only equal to California, have ten times the population? An important, and perhaps the most important, reason is the fact that these states face the Atlantic instead of the Pacific. A not inconsiderable part of the development and prosperity of the North Atlantic states has been due to the immigrants who have come in such vast numbers. The European countries have had the expense of raising these people, and this country has had their earning power. If it takes $1,000 to grow an immigrant and 1,000,000 of them come to America in a year, as was the case before the war, this is an annual present of $1,000,000,000 to the United States. Most of it was presented to the eastern part of the United States. It cost an immigrant $40 to come from Europe to New York. It cost him more than $60 additional to get to California. Hence he came here only in small numbers.

What the future holds in store for California no one knows. I am frequently asked how many farmers California can accommodate, and I just as frequently answer, "I do not know." But I can give you a few facts, or near facts, which may help you to reach your own conclusions. It is estimated that the possible tilled area of the North Atlantic states is twice, and that of the three corn states three times that of California. The possible tilled area of California is greater, however, than the present tilled area of the North Atlantic states. It is estimated that one-half of the 100,000,000 acres in California is suited to some agricultural purpose, and that it is possible to till 30,000,000 acres, although only 5,000,000 acres are now actually being tilled. If the tilled area was in the same proportion to the area which it is possible to till as it is in the North Atlantic states, twice the area would be under cultivation, or if the same relation existed between the possible and actual tilled area as in the three corn states, three times the present area would be under cultivation.

Since 40 acres of irrigated land in alfalfa and dairying or in fruit supports a family in California quite as well as 200 acres in the North Atlantic states, or 160 acres in the corn states, it seems not improbable that California may support as dense a farming population as that of the other states under consideration.

It would be a brave person indeed who would attempt to determine fully and finally what influence the war is going to have upon the American farmer or the California farmer. I venture, however, to make a couple of suggestions. Formerly a large amount of capital required to finance American corporations came from Europe. As the saying went, the United States was dependent upon London for money. I understand that this was particularly true in California. The income from these bonds and stocks was of course spent in Europe, mostly for food, clothing, shelter, education and recreation. In the last two years and three months staggering amounts, literally billions, of these bonds and stocks have been sold back to Americans. If these Americans continue to hold the stocks and bonds, the income from them will in the future be spent in America, largely for food, clothing, shelter, education and recreation. In so far as the income from these bonds and stocks has been and will be spent for readily exportable products such as flour, meat, cotton and wool, it is probable that the place of residence will not materially affect the American farmer, but in so far as these funds are expended for food products of local origin, such as milk, eggs, vegetables, fresh fruits and spring chickens, a new demand will be created.

It may not be revolutionary, but it would seem that it must at least be appreciable. On the other hand, the statement is made that Russia is getting ready for a great industrial development. It is said that as soon as the war closes Russian capital intends to import American labor-saving machinery, and that it is expected that wheat will be raised and sold at 50 cents per bushel. Such statements are often made lightly without any basis of fact. I have no means of verifying this one. I believe, however, that every student of the history of human progress feels that Russia will experience greater social and industrial changes than any other country in the world as a result of the war. If this prediction comes true the wheat farmer of the United States will doubtless be profoundly affected. It does not follow, however, that he will be permanently injured. In fact, in many sections he may be greatly benefited—probably in all sections where he can raise some other farm product just as well. For example, the Kansas farmer may be forced to raise corn and grass in place of wheat, and being forced to raise corn and grass he will keep live stock to consume them. Rearing live stock will increase the fertility of his soil. It also requires greater ability than mere wheat farming. What is more important, rearing live stock, as it will be conducted in the future, in connection with the raising of crops, requires more work, hence keeps more people employed on the land. The farmers' sons and daughters will not need to seek employment in the cities before they reach the age of maturity.

Since California is the land of fruits and flowers, the place where the farmer produces the highest forms of food, and since the state offers the leisure class a place to live in second to none, it would seem reasonable to suppose that the California farmer might be called upon to supply the needs of this class in a more than ordinary degree. I presume there may be some debate as to the advisability of supporting a leisure class, but if they must be supported, they may as well be supported at home as abroad.

There are those who believe that the United States will in the immediate future following the close of the war, come into a period of still higher prices for live stock. A number of substantial reasons are given for believing that this will occur. I do not know whether it will or will not occur, but I hope it will, since nothing can be of more benefit to the general agricultural development and welfare than an increase in animal husbandry. This is particularly true of California. A convention of horticulturists may not seem like an opportune place to make this statement. The fruit grower should welcome the development of live stock. The stockman makes a good market for his fruit and his orchards need the fertilizer that the live stock produces. It will help to make California a greater fruit state than ever. Animal husbandry is not overdone in California and probably never will be. It requires capital and it requires ability. Grant them, and it is a safe business. Animals and fruit are the products that California should produce, because they either sell for more than five cents per pound or they contain a considerable proportion of water. An important part of the remarkable development of German agriculture since 1870 has been due to the fiscal policy which has promoted the rearing of live stock.

WHAT ABOUT FRUIT BELOW ESTABLISHED STANDARD?

By HOWARD C. ROWLEY, Editor "California Fruit News," San Francisco, California.

The question of the disposition of fruit below the established standards is one which would among other things consider the possibilities of disposal of our fruits in various channels other than those of direct consumptive use. A consideration of the disposition of fruit now below the established standards leads directly to a question of by-products plants and similar lines of thought. To this particular part of the question I shall refer in but a small way, however, as it is an elaborate subject in itself.

My particular propaganda, if what I want to present to the California fruit public at this time may be dignified by such a term, is concerned with a part of the subject included under the title in your program, and which I am pleased to refer to as "What About Fruit Below the Established Standards?"

I am fully cognizant of the fact that just at the moment at least, any consideration of other than standard material or better is, to say the least, unpopular. The considerable advocacy of standardization in fruit circles in California recently, which has through its able presentation acquired a very popular acceptance, makes a consideration of views on the other side rather unpopular. I accordingly approach the expression of some views upon fruit below established standards with a full recognition of the fact that there is little present enthusiasm that finds public expression, for a consideration of this question on the part of the fruit growing fraternity, and particularly its public exponents, but I believe that many, if not in fact a majority, of the growers themselves individually are sufficiently human to have thoughts on what might be termed the obverse of the standard.

Personally, I am a firm believer in quality rather than quantity in everything, and I have always conducted my business and any affairs in which I have had a voice, in so far as I was able, along the lines of that theory. Accordingly, you will understand that what I am pleading for in the body of this paper does not arise of my personal inclinations but from a realization of the fact that we do not all think alike. The fact that I, personally, desire the highest possible quality and am not much concerned with quantity is, I take it, the result of individual and personal temperament, but there are many, and I believe the larger proportion, whose temperaments and inclinations tend in the reverse direction, toward quantity with the best quality obtainable without loss in quantity. There are a few, of course, who are not at all concerned with quality, with whom, to use a slang expression, which, however, is most expressive, "any old thing goes." This group, which is not in the majority but which is sufficiently large to make one wish it were much smaller, must naturally be left out and be allowed to reap the reward, or rather lack thereof, of its attitude toward life and the world's work.

It is my judgment that the larger part of humanity, and, for the purposes of this convention and this consideration, we may refer specifically to fruit people, is made up of average individuals concerned with average motives, which produce average results. If that is so, it must necessarily follow that the present movement toward standardization means a concern with a minimum above the average, otherwise there would be no call for the exploitation and development of the standard proposal. This convention has been largely considering, as a reading of this program indicates, advancement in quality and the establishment of standards, which, as I say, must be contemplated as being above the average, otherwise there would be no call for a consideration of the question. All this is in the right direction beyond question, to my mind, and, so far as I am personally concerned, is most heartily advocated.

It would seem, however, unpopular as it may be, during what is almost a crusade in the interest of higher standards, that some cognizance should be taken of the other side of the question lest we be carried away with the theory to the exclusion of practice, which must, I take it, result in less final accomplishment, when considered from the standpoint of the whole concrete result, than a procedure tempered by expediency, if you please, and a consideration of at least the rights and possible merits of the average. Hence, my subject, "What About Fruit Below Established Standards?"

Obviously, unless the established standards fall far short of what should be considered as standards, there is always going to be much fruit that will not come under the class of as good as or better than the established standard. Personally, I wish it were not so, but we must be practical.

Little time need be wasted with thought or consideration of fruit or any other product that is so materially below current standards of what is acceptable as to be utterly undesirable or commercially lacking in value under the tastes and requirements existing during any particular time. Such a product is the result of the efforts of inability and an intelligence not in keeping with the times in which it exists and follows indolence and slothfulness, which should be discouraged and never encouraged through any consideration of the thought or time of those concerned with progress toward better things, which alone is for the best good, not only of the future but of the present. We may accordingly pass over as unworthy of time and thought the results of the labor of anyone as shown in the production of fruit (which is the product we have under particular consideration at this time), which is plainly an inferior and undesirable product for general consumption.

The aim of the standard and standardizer is to improve the average, and, accordingly, as the average improves, the ideal of the standardizer, as expressed in the standard of the moment, becomes higher, with the result that a considerable proportion, at least, of our fruit in quality hovers close around and possibly just under the standard, using the word standard as a measure of quality, both in the article itself and its method of handling, packing and delivery to the consumer. It is well that all of any product should not be the very best. I wish to particularly emphasize that statement, because it is born of a conviction with me that arises from my personal disbelief in the ultimate working out of any theory which is based upon an entire equality.

To have standards and high quality in our fruit there must be some incentive for the effort required to produce and maintain that high quality, which the individal who does not or can not attain it, does not realize. If it were possible to eliminate everything in the way of fruit that was considered at the time as being what might be termed inferior and only the perfect specimens of production, and the perfect product of handling, packing, and marketing were left to remain, it is inevitable, I believe, that the standard of quality and perfection in handling would on the average deteriorate. There would be no opportunity for the more able operator to secure an increased reward as the result of his natural or developed ability, and it is my opinion that it is necessary, as humanity is at present constituted, that the stimulus or spur of personal gain and benefit be present in order that we may do our best. If these things are so, it follows that there is always going to be a considerable proportion of production in fruit lines, or any other, that is not up to the mark and equal or superior to the established standards of the time in quality or handling. If we have this product, either as the result of the raw material itself or as the result of inefficiency in its handling, what are we going to do with it?

There is a great deal of expression of desire cropping up of late which indicates an intolerance on the part of the regulators and directors of our fruit industry toward the fruit product of anyone which may not be up to some individual idea or standard. We have, and very wisely, our standardization laws, ordinances and requirements, but I disagree fundamentally with the theory which is endeavoring to eliminate otherwise valuable and consumable products which do not meet the requirements of standard as expressed by some individual or group of individuals, for the time being constituted as authorities or advisors. In place of establishing a standard, which, in order that it be valuable at all, must be a standard above the average, and then proceeding to eliminate or cast aside the balance, the much more practical procedure, in my judgment, would be the theory which prevails in some instances of establishing a standard which will give the producer of fruit coming within the requirements of its limitations the public and advertised advantage of his superior quality and at the same time allow the same producer, or any other, having other product below that standard, the opportunity of marketing it for what it is worth.

The basic standard below which the food can not be considered and must not be tolerated is that established by the Food and Drugs Act of the United States government, which says: "That for the purposes of this act an article shall be deemed to be adulterated, * * * in the case of food, * * * if it consists in whole or in part of a filthy, decomposed, or putrid animal or vegetable substance. * * *" This is the measure of what is and what is not fundamentally marketable. The remedy for any fruit or fruit product which is not fit for human consumption is action under the pure food laws of this nation and this state (and the state law follows the national in this particular) under this clause.

Plainly such a standard is not the standard that should be aimed at as one to advertise our fruit for the benefit of the individual producing it or the community in which it is produced. We accordingly locally adopt standards in the various lines, such as apples, grapes, oranges, etc., aimed at encouraging and enforcing as far as possible an average degree of excellence. So far, however, as the effort of the individual is concerned in attaining an excellence of product, either in the article itself or in its preparation and handling, much depends upon the individual ability in excelling others, and this must be taken into account in a consideration of the reward to accrue to a neighborhood or state in the desire to attain the enforcement of an average excellence of standard. We must, therefore, I think, for the encouragement of the individual producer and handler, allow each the proper reward for his labor and ability through comparison.

After we have eliminated what is obviously unfit for consumption, and which is covered by the pure food law standard I have quoted, we then proceed to consider the grading of all the balance. This result is best obtained to my mind through such legislatively encouraged standards as for instance the National Standard Apple Act, which provides for a certain specified standard of quality and pack, known as a United States standard apple pack. Any other apples which do not come under the head of being filthy and decomposed, etc., as provided by the pure food laws, are marketable for what they are. Under this procedure and method of establishing standards and encouraging quality, the product which is of superior merit can advertise itself as such by proclaiming upon the package that it conforms to the standard and is as good as or better than the established standard of the time and can obtain the added reward of its quality of product and handling, but, at the same time, any other fruit which is fit for human consumption can be handled and sold to such advantage as its character allows, and for what it is worth, it being plain to the purchaser that it is an inferior article because it can not be labeled as standard.

I believe this theory of standardization should prevail throughout, and I plead for this consideration of the fruit of any grower or section which, because of lack of ability or possibly circumstances beyond control, is not to be classed among the extra fancy but still has a value and a use. Standardization laws which prohibit transportation to any other fruit than that which is established as a proper quality of product or packing are entirely unjust and will in the long run either be overthrown by revolution or destroyed in principle through a deterioration of the standard set. There can be no misunderstanding, fraudulent sale or false pretense in the disposal of a product for what it is, and fruit which is equal to or superior to the established standards, when so marked, may be known at sight and sold accordingly, and what is still merchantable but not, for one reason or another, possible of being so marked may still have a material value, both to its owner, the consumer and the community.

In these days of rapid rise in prices and what is popularly known as "the high cost of living," the burden must not be increased by any attempt at eliminating any material part of the production of any community, which is consumable, because it may not be strictly Class A. There is, naturally, a considerable proportion of the consuming population which either can not or should not afford to buy the very best. Now, if we are to proceed, as is advocated in the theories of some of the standardizers, along the lines of elimination from the market of seconds and culls, or cheaper forms of packing, we shall be doing an economic harm of considerable magnitude in destroying or eliminating otherwise valuable food because it is not topnotch.

If, for instance, a Class A box of some sort of fruit is worth at the retail store to the consumer $1.00 and some consumers can not afford the Class A price, why should they be prohibited from purchasing a second or third rate article of the same character but inferior in some regard in its quality or method of preparation, at 50 cents or 60 cents say, which the producer might be glad to sell, if it shows him any profit at all in the handling. I believe it is an economically unsound policy to destroy anything, providing there is value in it, and the sale of any fruit product which is wholesome and has sufficient value to any class cf consumers to allow of its handling and transportation should not be illegal. Otherwise there is destroyed a value both to the consumer and producer.

This question has come up in connection with the activity of some of our local officials in California recently, and a number of our horticultural law administrators are, from their expressions, inclined to consider the apparent theoretical good of the whole in their community rather than the practical questions involved with the producer and consumer. There is not opportunity to go into specific instances of this disregard of what I consider the fundamental rights of buyer and seller because it would lead into a lengthy discussion, but I plead for a practical establishment of standards and encouragement of quality through allowing the efficient to reap the reward of their efficiency, while at the same time not destroying any values which exist where the product is consumable.

The remedy for a product of too low or inferior a grade easily works itself out on economic lines as the cost of handling, transporting and selling is largely the same with the low as the high grade and the saving, wherever there is any, with the lower grade product is but small. Therefore, there is no encouragement for the producer to purposely and intentionally produce an inferior article, and where he is behind in efficiency through lack of knowledge, I believe proper results will be more easily effected through educational methods than the use of a legal club, which, nine times out of ten, or oftener, is wielded with injustice.

The various organizations and associations of growers which are striving for improved quality in their fruit will do well to eliminate the lower grades, while at the same time retaining the value inherent in this product to such extent as it is, through the manufacture of by-products of various sorts, and the obtaining of the largest part of whatever value is present in any fruit through its use in manufacturing and by-products channels should be a part, and a large part, of the consideration of those of our institutions and associations that are working for standardized quality in our products, in place of, as is often the case, merely turning such aside and thereby losing to the community and the owners whatever of value it may have.

One specific example which comes to mind and makes a definite and easily understood point in this case is contained in the remarks of a grower of pears in the Sacramento River district, in addressing a recent committee conference on our horticultural laws. It was being proposed that our state fruit standardization law should be so amended as to prohibit not only, as at present, the interstate shipment, but all shipment of fruit not in accordance with the standard. This met with the hearty and apparently general commendation of the meeting, until a pear grower present cited a specific case of his own this season, in which it appeared that a considerable tonnage of pears which he grew had turned out scabby for a reason which he could not at the time control. Under the standardization theory of the extremest, here was a product that was worthless because not perfect. This grower explained that he obtained exactly 50 per cent of the otherwise ruling value of these pears through the transportation and sale of them to a cannery, which cut them in two and was able to use the perfect halves, thereby conserving for the grower and the community and all interests concerned 50 per cent of the value of the product. This example shows concretely a part of the point that I am trying to make. Why should we think of eliminating this 50 per cent value which existed when it may just as well be had and at the same time, to some extent, assist in keeping down the average cost of living and high prices to consumers?

In the matter of packing: it is not all consumers that can afford to pay for the highest priced and best package. There is no reason why they should be prohibited from getting what they can for what it is worth, providing it is consumable. The encouragement which results from the reward in increased prices to the producer and vendor of a superior article is, in my opinion, sufficient in itself to encourage on economic grounds the development of superiority, providing the community makes it easily plain to the consumer when he is and when he is not getting the best.

I accordingly plead for the establishment of standards and quality under this theory of regulation, which will prescribe a high standard to be marked as such, and allow of all other produce, which is not deleterious to health or definitely injurious in other ways to the neighborhood into which it comes, being sold for what it is worth, if the owner and consumer agree that it is worth sufficient to pay the cost of its handling and sale, always, however, with the understanding that it must be plain to the consumer just what he is getting. If it is made impossible to deceive or mislead a consumer through offering an inferior or unfit product for better than it is, the balance of the problem will take care of itself.

The subject under consideration easily leads into discussion of a number of subdivisions and special lines of possible handling, as, for instance, drying, canning and the various by-products, but there is not opportunity to consider these here and now, and the foregoing general principles can be applied to the specific lines by those concerned with them.

THE IMPROVEMENT OF NURSERY STOCK.

By A. L. Wisker, Loma Rica Nursery, Grass Valley, Cal.

Among the several subjects that are of practical importance to the orchardist today, the improvement of nursery stock is one that never fails to interest both the man who plants the tree or vine and the man who propagates it. On the proposition that the improvement of nursery stock is in every sense desirable, if we are to progress toward perfection in our horticultural endeavors, orchardist and nurseryman alike find at least one point upon which they are in complete accord.

While the orchardist can, and does, directly contribute toward this improvement his opportunities are to some degree limited, and it is rarely that he actually calls into existence a new variety or improves an old one. His contribution to our progress must largely consist in observing the behavior of the hundreds of thousands of seedlings and the mutations and bud-sports—Nature's own chance-children—that are continually coming under his notice. In the past most of our acquisitions in the way of new varieties may be credited to observant orchardists the world over, and while these men were often humble and obscure they have placed us in their everlasting debt.

In these latter years another class of men has added immeasurably to our horticultural wealth. These are the plant breeders, who, with more or less definite plan and an intelligent purpose, have scored a remarkable advance over Mother Nature's haphazard ways of plant improvement. We here find the names of such men as Hansen, Munson, Burbank, Etter, Sharpe and others, all of whom command our admiration when we contemplate their patient industry and perserverance.

Still another factor in the improvement of our orchards and nurseries has been the work of both scientific and lay investigators in assembling from the far corners of the earth desirable varieties and new species. To such institutions as the Arnold Arboretum and to such men as Gillet, Rock, Roeding, Meyer and Coates, we owe much for accomplishments in this direction.

Of no less importance is the progress made by that body of scientists attached to the Department of Agriculture and to the several state universities and experiment stations. These men now have under way many experiments dealing with such matters as improvements in root-stocks, designed to meet every condition of soil, moisture and the underground attacks of insects and plant diseases. Naturally such experiments must usually be carried on for a considerable period before wholly conclusive results are accomplished. One of these experiments that has been in progress long enough to permit definite conclusions is that of the Southern Oregon Experiment Station, where Professor Reimer has been working for some years with many species of pears in an endeavor to find a stock that would be free from the disadvantages of the French seedling.

As is well known to most orchardists, the French root is subject to great injury from attacks of the pear-root aphis and is particularly susceptible to pear blight. As it suckers readily and these suckers often carry blight to the underground parts of the tree, the use of the French root not only adds to any system of blight control the heavy expense of eradicating blight from the root, but it at the same time constitutes an added and needless menace to the life of the tree.

Reimer's work has been most systematic and has demonstrated that great improvement in nursery stock will result from discarding the French seedling and substituting the Japanese or Chinese seedling, sometimes called the sand pear. For years this was known to botanists as "*Pyrus sinensis*," but Rehder, of the Arnold Arboretum, has recently determined that "*Pyrus serotina*" is the correct name of the species generally used by nurserymen under the names "Japan seedling" or "Chinese seedling." This species is quite resistant to attacks of the woolly aphis of the pear and remarkably resistant to blight. Reimer repeatedly inoculated the roots of this species with blight without producing a single case of the disease. At the same time he made similar inoculations with the same culture in the roots of French seedlings in adjoining rows, killing 100 per cent with blight.

This species produces a tree of great vigor when used as a stock for our commercial varieties and makes a perfect union. Although in satisfactory use in the eastern and southern states for over fifty years its use on the Pacific Coast dates back less than ten, but its desirable qualities are now so generally recognized here that it appears destined to supplant the French root within a short time. Harry Nicholson, a Tennessee nurseryman, is now using the Japan root in an experimental way as a stock for apples, to obtain a root that will not be injured by the woolly apple aphis—a pest that makes apple growing impractical in some nurseries.

Nurserymen will welcome the discovery of a stock for apples that is aphis-proof and which will avoid the cumbersome method, now practiced to a slight degree, of double-working on Northern Spy, a variety somewhat resistant to aphis.

Plum growers realize that there is much room for improvement in the stocks now in use for this fruit. Myrobalan, the stock usually used for moist soils, is very susceptible to crown gall. The same is true of the peach root, which is generally used in dry soils. Peach root has the further disadvantage of making a most unsatisfactory union with many plums, among them being Diamond, Grand Duke, Yellow Egg, Robe de Sargent, and Sugar. A stock for plums that will give as good results on dry soils as the peach, that will make as good a union with all varieties as myrobalan, and that will be as free from crown gall as the Damson, without its tendency to sucker, would be of greatest advantage to plum growers. Leonard Coates has been experimenting with several new plum stocks, and as he is already responsible for the introduction of a number of valuable varieties of different fruits, and for the selection and propagation of certain desirable strains of other varieties already known, it will only be in keeping with his past achievements if he should score another improvement in this direction.

A seedling peach from China, now the subject of an experiment by the Bureau of Plant Industry at the Chico station, promises a stock that is remarkably resistant to alkali. If present expectations are realized it is probable that peaches, apricots, nectarines, plums and almonds can be worked on this root and grown on soils now wholly unsuited to their culture.

An interesting field for the improvement of nursery stock has been opened up during the past few years by the work of various investigators in propagating from selected strains within any given variety. Shamel's work with citrus fruits is an example with which all Californians are familiar. Authorities on plant-breeding recognize the occasional occurrence of mutations or bud-sports within a variety that lead to some modification of type characteristics. These modifications may be so slight as not to be easily recognized as a departure from the original type, or they may in truth constitute a subvariety that represents a regrouping of varietal traits sufficiently striking to represent a marked improvement on the original type. Probably many of our so-called "improved" strains of certain varieties are merely bud-sports closely resembling the parent type.

The propagation of trees from these mutations is one of the sources for the improvement of nursery stock that is not yet fully appreciated, and both nurserymen and orchardists should give greater attention to the recognition of desirable bud-variants. At the same time, nurserymen must recognize the fact that bud-sports are as apt to occur in the descending as in the ascending scale, and should be extremely careful to take wood for budding or grafting from trees that show the desirable characteristics of the variety to be propagated. In deciduous fruits there seems to be less of a tendency toward reversion to a less desirable type than in citrus, but probably the general principle holds good with both that an appreciable improvement in nursery stock will result from careful bud selection.

However, it is probable that the hereditary influence of bud selection merely creates a tendency toward certain results, and that this tendency may be wholly nullified by unfavorable environment, at least so far as color, size, or fruitfulness is concerned. These characteristics are variable, often changing in the same tree from year to year, and are so dependent upon climate, moisture, culture, plant food, and pollination that it is wholly unlikely that they can be controlled by any improvement or lack of improvement in nursery stock, although it is reasonable to believe under similar conditions better results will be obtained in the orchard from nursery stock propagated from trees representative of the best strains of any given variety.

Although many of the best horticultural authorities of the nation do not accept the theory that trees can be "pedigreed" in the same sense as live stock, the evidence is certainly sufficient to indicate that careful selection of budwood on the part of the nurseryman is a wholly desirable practice. In connection with a selection of the best rootstocks available, it represents his most important contribution to the improvement of nursery stock, since he is essentially a propagator and disseminator but rarely the creator or even the discoverer of improved varieties.

In order that nursery stock may be improved in the broadest sense of the word, the orchardist must be continually on the alert to observe all that is desirable among Nature's raw materials the chance seedlings and bud-sports; the plant breeder must take the most desirable traits from the best we have in each fruit and endeavor to combine them; the scientific investigators of our experiment stations must enter the practically neglected field of rootstock investigation and determine, not only the affinity between stock and cion, but the root that is best adapted to certain soil conditions and best adapted to resist insect pests and plant diseases; while the nurseryman, profiting by all that these have done, must get out of the rut of blind and thoughtless following of old horticultural trails that have naught but antiquity to recommend them, and he must fully understand the great responsibility resting upon him as counsellor and guide to many orchardists. He should never forget the cruel disappointment to someone that must inevitably follow either his carelessness or his dishonesty if he should allow stock to leave his hands other than that which his customer desires. He must place his business on a higher plane than that of mere buying and selling and must feel that it is his mission to be an agent in helping Nature add to the welfare of mankind.

With this fourfold force in intelligent cooperation the improvement of nursery stock will be greater than we can at this time imagine, and its effect upon horticultural development will be so far-reaching that we can not even attempt to estimate the results.

IMPROVEMENT OF NURSERY STOCK.

Discussion by **LEONARD COATES**, Owner Leonard Coates Nursery, Morgan Hill, Cal.

I want, first, to thank Mr. Wisker for the paper he has presented and I feel personally reassured when such men as he are taking a prominent part in the fruit industry of California. I used to deplore the fact that while we had many hundreds, if not thousands of alert fruit growers in California we had comparatively few horticulturists. Most of them seemed to have passed away twenty-five or more years ago. It may not be so and it is not so literally, but they have kept unfortunately in the background. Mr. Wisker, who is recognized as an educator in this line, has talked to you on one of the chief fundamental facts in horticulture and of the higher aims of the nurseryman's profession. It is his life's work. He devotes his whole study and time to these matters. The fruit grower is too busy, and his mind is too much occupied with the growing and marketing of his fruit, to give attention to these little details, which, as your chairman has said, are of such vital importance. They are vital for many reasons, first, because they begin with the very root of the tree, and, second, because the bud which is inserted in the rootstock produces the fruit which you will eventually pick.

Some reference was made to plum stocks. I am experimenting with some of these and they might, in some cases with some varieties of fruit, be an improvement on the myrobalan stock. You all know the main reason, doubtless, why the myrobalan stock was used so extensively and has become such a favorite stock in California, at least in the heavy lands. The main reason it became popular a great many years ago was because it was not apt to sucker. We used to grow in the earlier days, thirty or forty years ago, several varieties of domestic seedlings on which to graft or bud the plum. Some of these would make larger and better trees than when grafted on the myrobalan, but all of them had that failing of throwing up suckers from the roots, and I must say that even now, with any stocks I have found in Europe and those I am experimenting with, all of them will sucker more or less when the root is cut or broken. In fact, they seem to throw up suckers more or less scattered through the orchard row. That is an objection, and I think if you should use some other plum stock—if any other is found that for any reason may be better than the myrobalan, you will have to put up with that drawback. It makes it more or less unsightly in an orchard but it seems something that we can not overcome unless we go back and stay with the myrobalan.

One reason I thought the myrobalan stock might be improved upon was because of its tendency, or settled habit of starting growth very early in the spring. I think a great many of our prunes, plums and apricots when they are used on that stock, are forced into growth so early in the spring that they are more apt to have this affection of so-called "sour sap" which generally I believe is caused by a low temperature following warm weather. The sap is checked in its flow, and more or less rupture of the sap vessels ensues.

For that reason, when I was in Europe I looked around and found that the myrobalan stock is not used at all in any countries I was in. They are grown in France entirely for the California trade. Until the California trade demanded them they were practically unknown and only used in an experimental way as a stock for dwarfing certain varieties of plums but never have been used extensively for any of the stone-fruit family. There are certain stocks there which have been grown from some of the wild plums and are now fixed as varieties, being kept true by propagation by means of layers and not as seedlings. Seedlings of course will vary and you can not get uniform stock from them, and that is one reason why we have more variation in the growth and size of our trees on the myrobalan root. There is great variety in the myrobalan as a stock being grown from seedlings. You have noticed that the seedlings differ in the color of the wood, varying in their shade from a deep green to almost black or a deep purple. Some are thorny, some are smooth. Some grow upright, and some are bushy. In France and England they use stock that is grown from layers, such as the "Mussel" plum, the "Brompton," the "Common" and so on. The stocks are planted in beds and remain there permanently. The sprouts from these stools after rooting are then planted in the nursery row and there grafted. Whatever that stock is there is no variation from it, as it is an off-shoot from the parent. Those stocks are much slower in starting a flow of sap in the spring and for that reason I think they should at least be experimented with to see if there will be any prevention of that very prevalent disease of "sour-sap."

Passing from that, the main point which I wish to emphasize in this discussion and one to which I have given more attention is the study and use of bud-variants. Men who have investigated this matter very thoroughly of late years have come to the conclusion—and have so stated—that whereas we used to think all new varieties or practically all new varieties originated as seedlings—it is a great mistake, and the larger number of the varieties of fruit which we cultivate originate as bud-variants. This, of course, is in line with the Mendelian theory of mutation and the fixed law which governs these mutations. Periodically and systematically every plant will throw off a bud-variant or variety. It may be in scores of years, hundreds of years or thousands of years or millions of years, but at any rate all plants at certain periods systematically throw off these bud-variants and hence the multiplication indefinitely of new varieties. It brings it down to a very fine distinction, as Mr. Wisker intimated, as to what is a variety. Pomologists know varieties and subvarieties and expert pomological opinion has to be able to designate what is a variety and know where one plant, one individual, differs sufficiently from another of the same species in order to be assigned a distinct name. That is a matter which only expert pomologists can determine. There are some mutations or sports or bud-variants which are so very distinct that any one at once can see they are entitled to that distinction as a different variety. I might mention some few very well known illustrations. You can take the nectarine. It is simply a bud-variant from the peach. Any one knows it is entirely distinct. At the same time botanically there is no difference between that and the peach. It is simply a variety, a sport, a bud-variant of the peach. Another well known illustration may be the Pierce grape, which originated in the old Pierce vineyard in Santa Clara a great many years ago and was called the Isabella Regia or Queen Isabella. Some of you may remember seeing that variety in the market years ago. It sold at $2.50 a crate. The fruit was kept by Mr. Pierce to himself for a long time and finally it was disseminated by the California Nursery Company and named "Pierce," and that originated from one bud which grew on the eastern Isabella grape. It was so distinct that it was easily noticed as a new and distinct variety.

I found a few years ago a sport, just as marked, of our well known French prune, a tree in a certain orchard at Saratoga. This tree above the graft had one branch which bore an entirely distinct and different fruit. Instead of oval or oblong, more or less pear-shaped, this fruit was what would be called obtuse-obovate. It was almost square-shaped at the ends, so much so that it could stand up on its own bottom either way. That fruit was large and made a record of running from 31 to 39 to the pound dried. In order that it might be tested thoroughly, as to whether it was a fixed variety, buds were taken from the branch and are now in bearing, producing the same fruit with those peculiar characteristics.

Any grower who is observant, and there can be no true horticulturist who is not observant, will notice great peculiarities in different fruits in his orchard and it is quite probable that those peculiarities may be perpetuated. I noticed in Napa Valley (in 1882) a great difference in the French prunes as grown commercially. I made a collection of them here in different orchards and there was a water-colored sketch made which was reproduced in the old State Board of Horticulture Report in Mr. Lelong's time, and any one would think it was a plate of different varieties and yet they are all French prunes grown under similar conditions. No attention was paid to it at that time. Every one thought the French prune was a French prune and nothing else. The whole matter was finally dropped, but I still thought there was a good deal of difference. Years after I had correspondence with Professor Hedrick of New York, and in his great work, "The Plums of New York," of several volumes, he makes the remark that the "French prunes as grown in California is worthy of varietal recognition." That comes from an authority and it merely confirmed me in a conclusion I had come to a good many years previous. Again my opinion or conviction was confirmed still more when I was in France five years ago and spent some time in the prune districts. I found there that the small farmers were grafting more or less, some of their prune trees, which largely were grown from seedlings or reproduced from suckers, offshoots from the orchards. The fact that those trees originally were grown as a more or less mixed lot from the seed and propagated from suckers shows that there must have been variation, because they were all originally seedlings; and when we got our first grafts from France, brought out, as history tells us, in the early days of Pellier, a sailor, and a brother of a man living in San Jose—he brought these grafts out and naturally they were taken from different sources and might easily have been more or less mixed unconsciously, and we so imported several types of the French prune.

This matter was treated thoroughly by the late Felix Gillet, and unfortunately he died while he was still working on the matter. He had, however, introduced several distinct types of the French prunes and they were disseminated throughout California. Here and there you may find these trees where the grower, the owner, has kept them separate, and you will find those distinctions. He had them under certain names.

What I want to impress upon you is that we may and can raise the standard of our French prune and not only of that but of all fruits in the same way, by careful attention to bud variation. It can not be done at once. It is impossible to improve all of our stock and all of our orchards immediately or in a very short time, but if all growers insist upon greater care being given, insist upon knowing the sources from which certain buds or grafts are obtained, it will all aid the nurserymen and back them up in their endeavor to raise the standard of the fruits.

There are scattered about the state and introduced more or less every year several so-called new varieties of fruits, often put upon the market under the name of the originator or some introducer, and these almost invariably are from bud-variants, from some tree in an orchard which has been found to produce exceptionally good fruit. It is not enough simply to propagate from a tree which has a good crop but it needs to be watched over for a series of years. We need to keep a record and follow more scientifically and carefully its improvement by bud selection following along the lines of the orange growers of southern California, where they have expert men under the Department of Agriculture directing these operations. That has been done for a number of years and is recognized down south as the only way to get a profitable orchard. As you know and as has been explained by the experts who have these matters in charge, a book account is kept of certain orchards, where each tree is mapped out and a record kept of its productiveness and the quality of the fruit this individual tree produces. It is then the work of this important branch of horticulture and of those men who are working out these practices to eliminate all of the so-called drones. A tree which doesn't produce properly is called a "drone." That tree is not grubbed out but it is used as a stock on which to bud or graft from another tree which has made a record of profitable bearing, and it has been surprising to find out how many drones there are on every acre of orchard. You may all realize how much would be the added profit or yield per acre if every tree in the acre, of the 60 or 70 or 100 per acre, were a profitable investment; and every one of you, if you should take note during the coming season and keep a record and note every tree, mark every tree as to its productiveness, would be surprised how many individual trees do not pay. We want to remember that every tree is an individual, just as every bud is an individual and the peculiarities and characteristics of those individuals may be propagated through the individual bud.

We may propagate fruit trees with a tendency to the production of wood just as easily as we can propagate trees for the production of the best quality of fruit. That was shown you in the remarks of Mr. Wisker, who told you that bud variation might just as easily tend to reversion as to improvement. It has been and is the practice, of course naturally, in propagating, or it follows rather as a natural sequence in gathering buds or grafts for nursery purposes, that a man going into the orchard to get the buds or grafts, naturally and with very good intent takes them from the most vigorous trees. That at first would seem to be good practice, but when you stop to consider, if that is done continuously year after year and generation after generation, if we cut all the buds from the trees which show the most wood vigor, what are we doing? Naturally and obviously, we are propagating and breeding towards wood production rather than fruit. That is an absolute law just as much in the vegetable kingdom as in the animal kingdom. In the same way, if we should bud from a certain tree or trees and only from those that are making and have made always a record for production of good fruit, we are breeding to fruit rather than to wood. I can mention the names of two practical growers of very many years' standing and experience—I don't know whether either of them has been in attendance at this convention or not—who have done this with cherries. One is Mr. Rolla Butcher of Sunnyvale and the other is Mr. Ridley of the Willows, San Jose. Both of them are of large experience and both are interested in the Royal Ann more than anything else. and they have both told me that the cherry trees they buy don't do well. They fail to produce or they are so long in coming into bearing. They have both come to the same conclusion. They have trees of their own which they had many years ago, some imported from France, some from the nurseries, and those trees where they propagated from an individual specimen which is known as a large and regular bearer, which both of them have done, come into bearing early and bear regularly, and they have come to the conclusion and both have told me in different ways and at different times that they believed that was the reason—unconsciously we have been gradually breeding to wood rather than to fruit. That, of course, as I say, is a law in horticulture and it is something which we ought to recognize and pay heed to. It can be done either way. We can propagate either way. We can breed up or down. It is only by strict attention to these things and insistence that the nurserymen know the sources from which they propagate that we shall get steadily and regularly from year to year an improvement in this matter.

I know and I am sure that it is of most vital importance, and I hope that the very carefully written, carefully worded and carefully compiled paper of Mr. Wisker will be given very great attention, and I am quite positive that all he has said is literally true and should be heeded by every nurseryman and fruit grower.

THE MARKETING OF FARM PRODUCTS THROUGH THE MEDIUM OF THE PARCEL POST.

By S. GLEN ANDRUS, Secretary-Manager, Chamber of Commerce, Sacramento, Cal.

I do not profess to be an expert upon the subject upon which I am to address you today, viz: "The marketing of farm products through the medium of the parcel post." I make this explanation by reason of the entertainment we enjoyed yesterday afternoon, when the subject of the scientific marketing of farm products was under discussion and when Col. Harris Weinstock and John L. Nagle were the chief actors. It was one of the best free entertainments I have ever enjoyed. It scintillated with brilliant repartee, with invective and with high-class oratory, but, I am sorry to say, was not particularly educational in character. I realized, however, before that entertaining session had closed that if I were to talk upon any segment of this great circle of the scientific marketing of farm products, I must either buckle on my armor for battle, if I were to pose as an expert or seek a safer course. Being a man of peace I have, therefore, taken the latter course and declare to you that I am not an expert but simply an humble student who is studying the question and who dares to hope that at some time we may obtain a more economic and more intelligent method of distribution of our farm products. In not being an expert upon this subject, I am not, I dare say, laboring under any disability that any other man would not be laboring under were he here in my stead; for, after all, about all we know regarding this subject is theoretical with the exception of the meager and inefficient and partial use the government is trying to make of the parcel post in the distribution of farm products and with the other exception of a small, though apparently highly successful, experiment conducted recently in the city of Sacramento under the auspices of the Pomona Grange and under the supervision of Master Joseph Holmes of the State Grange. The results of that experiment seemed to indicate that if this country ever does adopt an intelligent and economic system of distributing our farm products, the parcel post may become one of the many factors in that system and in the solution of the general problem.

Before entering fully into my subject I desire to state that all I know about the economic distribution of farm products I learned from the master mind of the century upon this subject, the Honorable David Lubin, founder of the International Institute of Agriculture at Rome, and delegate from the United States to that institution. What I say to you today, therefore, will be a feeble effort to convey to you some of the ideas of Mr. Lubin upon this subject. If any doubt exists in the minds of anyone here present that an economic distribution of farm products be necessary, he has only to learn that there is an annual disappearance, let us call it, of six billions of dollars from the farm to the kitchen of the consumer in the annual marketing of our farm crops. In other words, it costs six billions of dollars to place the farm products of the country upon the tables of the consumers and manifestly, therefore, something is wrong with the system. Such a waste as this in the administration of human affairs creates a problem that we all can and should study, because we are vitally interested therein. It is a problem about which we should sit down and reason together and any man who is studying this problem earnestly and intelligently and patiently should be given full credit for so doing. We should not, it seems to me, criticise those who are working along lines which they think will lead to better distribution of farm products but should sympathetically discuss the situation with them and try to assist them. It does not make any difference, in the final outcome whether the system that shall be adopted shall be the system which you may think best or the system which I may think best. I dare say, also, that before the problem shall have been successfully solved a great many experiments will have to be tried in order that they may be eliminated from the situation.

At this point permit me to say that I have never been able to understand the opposition to the study and consideration of this problem which seems to come from the existing distributing agencies. If I represented a railroad, or an express company, or any of the cooperative distributing agencies, or was a jobber, I would welcome any advance that might be made toward the economic distribution of the products which I handled. I would realize that you could no more stop progress in this respect in a civilized nation than you could stop the general progress of the human race and I would also realize that the more economic system of distribution of farm products, the greater would be the demand. As a result of this increased demand the number of distributing agencies would be greatly increased. Likewise were I a grocer, for example, in the city of Sacramento, I would not have opposed the experiment which was conducted there in the use of the parcel post as a medium of distribution of farm products, but would have assisted it. I would have done this in the full realization that if by some means I could cause all of the farmers in the surrounding country to come to the city every day and successfully sell their products, the demand for the general goods which I carried would be greatly increased and at the expense only of a few "green goods."

Perhaps some that are here today are not fully convinced of the necessity of a better method of distribution of farm products. If so, stop and think for a moment.

California has the best climate in the world, the most fertile soil to be found anywhere, living conditions which are as near ideal as possible and broad and fertile acres to be settled by individual farmers and yet the farmers do not come. Ask yourself why. The answer is obvious for conditions have become such in this country that the farmer, as a rule, does not have his full political, financial and social independence, and until it is possible for him to attain these, we are not going to see a large and healthy movement toward our unoccupied lands. It is for the purpose of stabilizing the government through conditions which make it possible for the farming community to obtain social, financial and political independence that we are seeking an economic method of distribution of farm products. It is not because we love the farmer "*per se*."

Nations are made up of two elements: The radical and the conservative. The radical element lives in cities, and the conservative element in the country and these two elements are always engaged in a tug of war.

When, therefore, the pull on either end of the rope is fairly even, we have a stabilized condition of government and one that makes for the advancement of humanity and the welfare of the individual as well as of the nation; but where the pull is stronger on one end of the rope than on the other there is instability of government. How do we know this? We know it because if history teaches us any lesson at all it teaches us that the moment the balance is not well preserved between the conservative and radical elements of the nation, the nation decays and dies, if this condition is allowed to continue. A reading of Gibbon's "Decline and Fall of the Roman Empire," will convince you of the truth of this statement. That is why some of us are taking such a particular interest in the condition of the farming community.

As I sat through the discussion of yesterday, a discussion which at times grew acrimonious and which was at all times almost utterly useless, I studied, as I love to study, what we civic promotionists are pleased to call "mob sentiment" or "mass emotion," and I tried to determine what was the subconscious sentiment prevailing and controlling the audience, unknown though it was to the individuals composing it. It became quite patent to me that the contending factions, if I may term them so, were both crying out for knowledge, knowledge, knowledge, and it seemed to me that these two factions were, after all, not so very far apart and that, if given definite information and knowledge, would soon be pulling together instead of contending.

The point is, my friends, that the solution of the problem of economic distribution of farm products depends almost entirely upon complete, positive and definite knowledge, information and light regarding marketing conditions throughout the civilized world. Therefore, manifestly, the problem is not a local problem; it is not a state problem, it is a national problem—aye, even an international problem, one which deems a national organization of the farmers themselves semi-officially connected with the national government which should give the organization its approval. Such an organization would be, as the Honorable David Lubin describes it, "An Eiffel Tower of Intelligence," "an all-seeing and never-sleeping eye," which searches out and brings to the door of every consumer specific information of where and how and when to market his products.

And it seemed to me yesterday, that there was another subconscious thought running through the audience and pervading it and that sentiment was against the kind of thing that your State Market Commissioner represented. If you noted that feeling and analyzed it you probably came to the conclusion that its reason is to be found in the distaste that lies in every normal human being against the creation of a preferred or special class. The creation of a state marketing system makes of the farming community a preferred class.

The best manhood and womanhood of America are to be found on our farms and they dislike having a government tell them that they are inefficient and must be assisted in taking care of themselves. When the government, therefore, assumes to create special laws preferring the agricultural class, it says to that class in effect, "You can not succeed, and unless you are taken into the lap of the government you will fail." In my judgment all that the intelligent, red-blooded farmers in the United States desire is a white man's chance to come into their own, and this can be given them by a proper adjustment of laws and conditions which are in no sense paternalistic but which will give him the opportunity of securing the kind of money to which the character of his security entitles him and which will enable him to handle his products with intelligence instead of with blindness.

Some of us might ask how it is we know that the tug of war between the radicals and the conservatives is not going on with equality as to the strength of the pull. We find the evidence of this in the last United States census which shows that the home owners of the farms are decreasing and the land renters increasing. In 1910, as shown by the census, fully 36 per cent of our farms were run by renters and the percentage is probably now nearer the fifty mark, and when it does reach that mark, the government and the nation had best look out, for that is the condition which caused the downfall of the Roman Empire. We cannot, therefore, my friends, stand still in this respect. We must either progress or go backward. We cannot stand still.

The history of the development of the human race proves that such development can not stagnate.

It was not my intention nor my province to speak to you as I have spoken upon the subject of the scientific or economic distribution of farm products in its entirety, but I could not refrain, after what I heard here yesterday, from giving you a few thoughts upon the two greatest economic problems that are confronting the American people today, namely, the economic distribution of farm products and rural credits.

With respect to the latter, I might call your attention to the fact that we have upon the statute books of the nation today a law which will give the farmer cheap money on the amortization plan. You are familiar with that plan and know that under it the borrower gradually reduces the principal each year as he pays the interest on the loan so that at the end of a long term of years for which the loan runs and during which he pays interest only, he owes nothing. The law is not a perfect one, but in its fundamentals it is based upon the landschaft system of Germany which has stood the test ever since the days of Frederick the Great. The best thing you can do for the communities which you represent is to do your part in seeing to it that your community is placed in position to avail itself of the benefits of this law.

I trust, also, that I may be permitted to say a word regarding the law under which California has created a state marketing commission. Personally, I believe that the law which created this commission is not a wise law by reason of the fact that it is paternalistic in the extreme and socialistic in tendency.

There is no reason why, as David Lubin puts it, the state should grab a chicken by the neck and run to market with it in the interest of the farmer any more than the state should grab a rocking chair and run to market with it in the interest of the man who manufactures it. The marketing commission is here, however, and while I do not approve of the law nor perhaps of some of the things being done by the Market Commissioner, nevertheless, I believe that everyone of us should do everything in our power and within reason to help the Market Commissioner to make a thorough and complete experiment, trial and exemplification of the law. In this way, and in this way only, can we learn whether the principle back of the establishment of the State Marketing Commission be good or bad and the sooner this question is determined the better it will be for all of us.

Begging your pardon for having entered into the larger field of discussion upon this subject I will proceed to tell you, briefly, the few things that I know regarding David Lubin's plan for the use of the parcel post in the marketing of farm products. It occurred to Mr. Lubin, who has done more than any man or agency in the history of the world to stabilize the world's price upon food products, that it might be possible to bring to bear upon the marketing of farm products the experience and the system which has been built up during the past 50 years by the great mail order houses of the country and to add to this system and experience the service and efficiency of the post-office department, thereby creating a large and helpful agency toward bringing the consumer and the producer closer together.

The system which Mr. Lubin takes as his example has been so perfected that single mail order houses now do a business of over one hundred millions of dollars annually and do it in individual units, a larger business than is done by any one of the great wholesale houses in the United States.

Having conceived this idea Mr. Lubin went to congress and placed his ideas and his plan before the proper committee for its consideration. He also presented the subject to the post-office authorities and hearings were held in Chicago at which representatives of the great mail order houses and representatives of congress were present. At these hearings Mr. Lubin laid his entire plan before the gathering and for the especial consideration and criticism of the managers of the mail order houses. He wanted to know from the latter if there was anything in his system which was weak or wrong or would not, in their judgment, work out satisfactorily. Finally Mr. Lubin reached a point with congress and the post-office department where they asked him if it would be possible for him to conduct an experiment to test the efficiency of his plan. The post-office department having no funds for conducting such experiments must, therefore, look for such means from other sources. David Lubin then came to Sacramento and interested the State Grange in the proposition, that organization agreeing to conduct the experiment. These experiments were carried on in the rooms of the Chamber of Commerce and at one other point and the grange made a report, a few copies of which I have left and which are available for distribution among those who are interested. The report shows, among other things, that all of the transactions carried on during the experiment were conducted without a single complaint on the part of a grocer or a consumer. It also contains statements from both the consumers and the producers, all of whom seemed to have been more than satisfied with the results and who seemed to be of the unanimous opinion that the parcel post was a good medium of bringing the producer and the consumer closer.

The system employed was very simple, as evidenced by the fact that farmers who had no previous experience in the handling of such things, were able to conduct the transactions with accuracy and without complications and mistakes. In some respects the system is largely automatic and it is pertinent to state that the system does not make the government act as a commission merchant. It is not, therefore, open to the criticism of being paternalistic in character. It is simply a system which tends to increase and enlarge the carrying capacity and efficiency of the parcel post through the medium of the post-office department. In fact there are only three parties to the transaction, viz., the post office, the producer and the consumer. With respect to the experiment in question the grange acted as the post office. The equipment necessary to carry on this business is very little, consisting of a set of shelves or simple racks, and any form of a rack that will accommodate small cards will do. The only other equipment necessary to the transactions are a number of tags, blanks and forms, all of which are quite simple and easily handled. The government issues these tags and forms and sells them to the consumer and the producer at a price slightly above cost in order to make the service self-sustaining. To the consumer is sold a coupon book, let us say $2.35 worth of coupons of 5, 10 and 25 cent denominations, the books being redeemable at any time at the post office. To the farmer is sold tags containing the farmer's number, the quantity units, the article to be sold, the price to be paid and the date, and containing a transportation coupon. The farmer, before he buys his tags is registered at the post office, not by name but by number and is thereafter always known to the post office and the consumer by number. In the experiment which was conducted the units of sale were as follows: One box, one dozen, one pound, one single, one basket, one sack and one crate, these quantity units being printed on the tags which are sold to the farmer. We are now ready to enter into the actual transactions. The consumer may or may not decide to go to the post office to order, but we will assume that a consumer does go to the post office to order. Then what happens? The consumer goes to the rack on which are hung a number of cards. She looks over the cards and finds for example that number 16 has 5 dozen eggs for sale at 25 cents per dozen, 10 pounds of butter at 35 cents per pound and five boxes of pears at $2.20 a box. The cards which the consumer finds upon the racks were made out by the farmers and picked up by the carriers for delivery at the postoffice. When the consumer has signified her purchases to the clerk in the post office he makes out the necessary cards indicating those purchases, adds the total sum of the purchases, tears out of the consumer's books the number of coupons necessary to represent the total purchase and returns the purchase cards to the farmer from whom the purchases have been made. Upon the receipt of these cards the farmer fills the order and has it already for the carrier. When the latter arrives he tears off the transportation end of the card leaving the order portion of the card with the farmer. At the end of the week the farmer sends his order cards to the post office where they are checked over and confirmed and the money is remitted to the farmer and the transactions for the week are closed.

The experiments were conducted uninterruptedly for 39 days and until June 17, 1916. During this time 41 producers and 99 consumers took part in the experiment and 460 transactions were made. The people generally, according to the report, were very willing and anxious to give the plan a trial. Not only locally but from far distant parts of the state came many inquiries regarding the plan. An idea of the way the experiment was received is gathered from the following statement made by J. L. Patterson of Orangevale, which is as follows:

"I would like very much to see this direct marketing go into effect, because it gives the small farmers better opportunities and makes it possible for the small farmer to make a good living from small holdings because it would enable him to dispose of the surplus which now goes to waste." The consumer's idea can be gotten from the statement of Mrs. W. E. Sanford of Sacramento as follows:

"The articles I purchased through the direct marketing experiment were far fresher than I have ever obtained before and are also far cheaper. I hope that congress will not delay action towards bringing about the direct marketing under the medium of the parcel post. It is what we house wives have so long dreamed about and hoped for."

That is about all there is to the story and in closing permit me to say that this subject is worthy of careful study by every human being having his own or her own welfare in mind, as well as the welfare of his or her particular community and of the entire nation; for until this problem has been solved, the stability of the nation will not be assured.

RURAL CREDITS.

By Dr. Elwood Mead, University of California, Berkeley, Cal.

The passage of the farm loan bank act creates a new era in financing the farmer. The act grew out of the increasing needs of the farmer for money. Farms have to be better equipped, more money is needed to carry them on. It costs more to grow fruit and other high-priced crops than it used to cost to grow wheat. In every way the farm requires more money in its operation than it did twenty-five years ago. But we have just come to realize that fact. We have passed a law that looks after the interest and business and commercial enterprise which enables farmers to get money at a reasonable price and on the right terms. But until the passage of the farm loan act there was no means provided that would help the farmer to get money at a reasonable rate of interest or on long enough time to enable him to pay it back out of the earnings of his farm. This act will give the farmer forty years' time with the privilege of paying up at any time within five years. It will enable him to pay it off in uniform yearly payments instead of having to pay it off in a single large payment, or in a few large payments. If, as seems probable, money can be furnished at 5 per cent, then the addition of the payment of 1 per cent on the principal or 6 per cent in all, will pay off a debt in thirty-six years. In other words, under this act the farmer can pay off his debt, principal and interest, with a lower annual payment than he now makes for interest alone.

These two things will relieve the farmer from the necessity of accumulating money to pay off a large lump sum at one time, and from the impending menace of mortgage foreclosure. They have proven of great value in other countries. They have enabled farmers to have better stock, to have better homes, better tools and grow better crops. They have done more perhaps than any single influence in countries where this system has been adopted, to better the agriculture of the countries that have adopted them. This system of course will soon have a trial here. There are one or two features of it about which there has been some misgiving. One of these is the requirement that in order to get money local associations will have to be formed. Ten or more farmers must unite together and the applications for loans have to be made by that association. There doesn't seem to be any real difficulty in that because the operation is simple and already over this state associations are being formed. I know of somewhere between thirty and forty associations in which every step that could be taken at this stage has been taken. I was in the Imperial Valley at a meeting recently where about one hundred farmers indicated their desire to belong to the first association formed.

It is expected that these banks will be ready to do business early in the spring. The date has not been fixed definitely, but April has been mentioned as the probable date, and when that comes of course it will mean a very considerable lowering of interest.

I have always advised farmers to borrow on long time. It has this advantage—it lessens the amount that you have to pay during the earlier years after the loan is made—at the time when the ability to pay is least, before the full advantage of the expenditures has been obtained; and all these expenditures must be made either for completing the payments on land or for the improvement of the farms.

This act is, however, almost entirely confined in its benefit to the men who own land or who at least have the money to pay for land. It doesn't do much to solve this great problem of helping men of small capital and especially young men, to buy farms. It is strictly a mortgage credit, in which security of the money loaned is not based on the character of the borrower but on the value of the security offered, and is, I think, the first step in the development of a great system of rural credits. But there are certain things in this country which make this only a first step. It needs to be supplemented by a system of personal credit, which will help young men to own farms and only the lure of ownership will do this. Now in Illinois over 40 per cent of the land is cultivated by tenants; in Oklahoma, 54 per cent; in Nebraska, 43 per cent; in Kansas nearly 40 per cent. The percentage of tenant cultivators is growing constantly. Something must be done to check it. Improvement in agriculture, political stability are best secured in the country where the great majority of the rural population own the homes they live in and the land they cultivate. One bill intended to help in the acquirement of homes by people of small means, the Crosser bill, is now before congress. There have been three investigations, one entirely by the federal government, one a combination of the federal government and the state of Wyoming, and the investigations carried on by the State Colonization and Rural Credits Commission of California, to ascertain exactly what the situation is in the farming districts with respect to the need of funds for the acquirement of homes and paying for them. All of those commissions have reported, or will report to the same effect—that what we need here is the system that has been inaugurated in practically all of the first-class countries of the world except our own since the beginning of this century.

It may be of interest to just review briefly a little of what other countries have accomplished in that direction. Germany, with its well-known sagacity and its ability to use the government as a direct agent of the service, has in six provinces since 1909 purchased one-fifth of the entire area of those provinces, formerly held in great estates and sold them out in small holdings, none of them more than 65 acres and practically none less than 25 acres, except the homes for farm laborers of two acres. The purpose was, first of all, to improve agriculture, and second, to improve social conditions, to get rid of a system in which there has been a great landed aristocracy on one end of the social scale, and a discouraged and discontented peasantry at the other end. In Ireland 9,000,000 acres or an area equal to one-third of the farm land of this state has been bought and transferred to tenants since 1903. In Russia over 3,000,000 farmers, poor in money, poor in experience, have been enabled to acquire homes of their own, have been helped in the building of houses, in the clearing of the land and making it ready for cultivation, since 1906. California can not ignore this movement and its lessons. We have 300 farmers owning over 4,000,000 acres of the most fertile land in the world, that today is either cultivated by tenants or not cultivated at all.

The commission that has been studying this subject during the last twelve months will soon issue a report. It has represented a great deal of labor. I believe it represents in its conclusions fairly what has been the result of the world's experience and recommends a course here that is in no sense an experiment, but which, under widely varying conditions and in widely separate parts of the world, has been a most wonderful success. I hope that it will all have your interest. I hope you will all be able to read the report and I hope that it will have the support in the legislature that it deserves.

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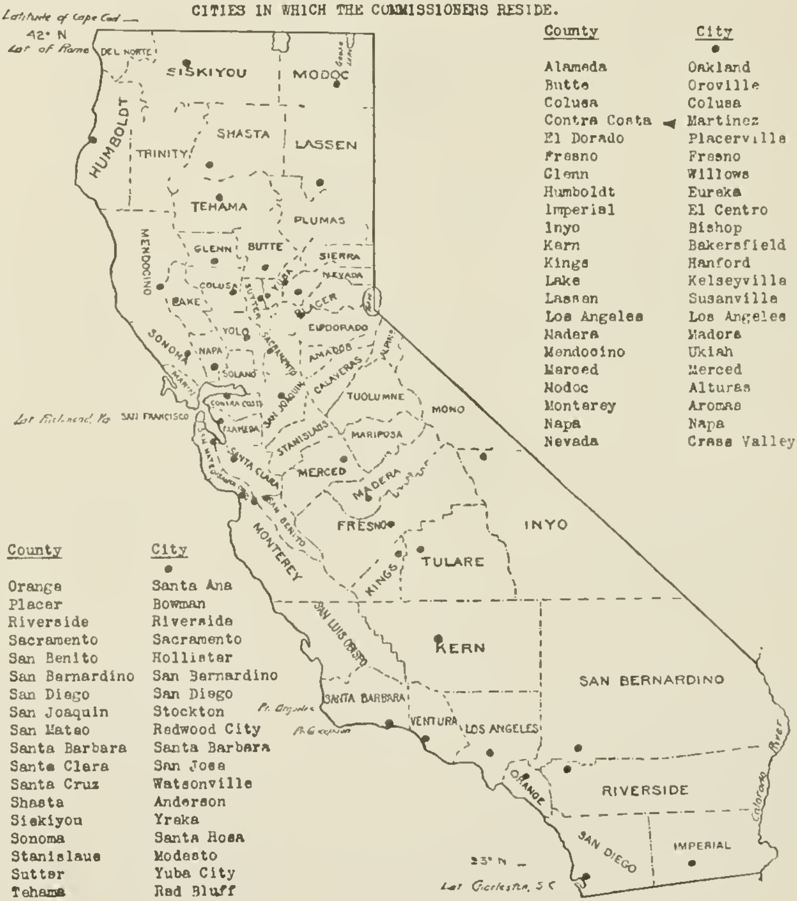
Latitude of Cape Cod —
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YOLO
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Glenn	Willows
Humboldt	Eureka
Imperial	El Centro
Inyo	Bishop
Kern	Bakersfield
Kings	Hanford
Lake	Kelseyville
Lassen	Susanville
Los Angeles	Los Angeles
Madera	Madera
Mendocino	Ukiah
Merced	Merced
Modoc	Alturas
Monterey	Aromas
Napa	Napa
Nevada	Grass Valley

County	City ●
Orange	Santa Ana
Placer	Bowman
Riverside	Riverside
Sacramento	Sacramento
San Benito	Hollister
San Bernardino	San Bernardino
San Diego	San Diego
San Joaquin	Stockton
San Mateo	Redwood City
Santa Barbara	Santa Barbara
Santa Clara	San Jose
Santa Cruz	Watsonville
Shasta	Anderson
Siskiyou	Yreka
Sonoma	Santa Rosa
Stanislaus	Modesto
Sutter	Yuba City
Tehama	Red Bluff
Tulare	Visalia
Ventura	Ventura
Yolo	Woodland
Yuba	Marysville

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1917

VOLUME VI No. ~~7~~ 6

THE MONTHLY BULLETIN

A fig leaf infested with the Mediterranean Fig Scale,
Lepidosaphes ficus.

OF

STATE COMMISSION OF HORTICULTURE

SACRAMENTO, CALIFORNIA JUNE, 1917

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CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VI. June, 1917. No. 6

WILD MUSTARD CONTROL.

By O. W. Newman.

An examination of data from experiments carried on in many of the eastern states in the control of weeds in grain fields, brings out the interesting fact that many noxious weeds, especially the wild mustards, including *Brassica campestris*, *Brassica arvensis* and *Brassica nigra*, can be largely controlled by the use of chemical sprays. The agricultural experiment stations in North Dakota, Wisconsin and other states have demonstrated this control method beyond a doubt for their particular states.

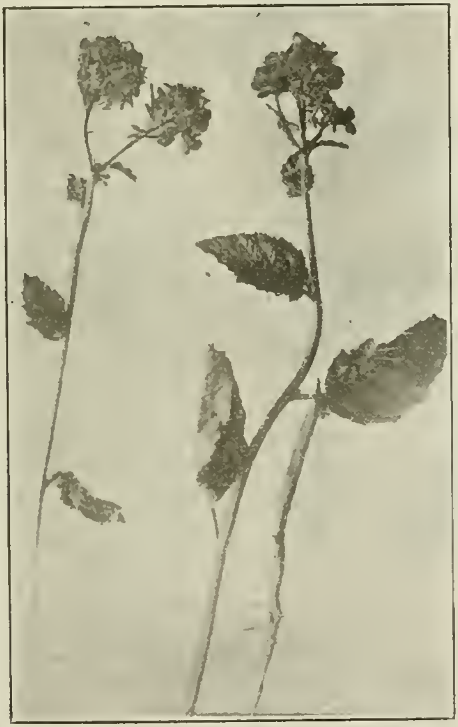

Fig. 46.—Wild mustard, *Brassica campestris* L., is one of the most common grain weeds in California. It is the earliest noxious weed to appear in the spring and as a result covers the ground when the young grain should be getting its strongest growth. (Original.)

Such measures of control are, however, a new departure in California, and there is abundant room for demonstrational work to convince the farmer of the value of the weed control methods used in other states. The time has come when we should give less thought to extensive and more to intensive farming. With crops selling at the extraordinary prices they bring at present, with land values increasing and a shortage of certain crops, it is not only right but profitable for the farmer to investigate every means which will increase his production.

Chemicals.

The chemical spray most commonly used in the East is a solution of iron sulphate. Many different chemicals were tried out with varying results. The iron sulphate in every instance proved the most satisfactory. The usual strength of the solution is two to one, *i. e.*, 100 pounds of iron sulphate to 50 gallons of water. This should be applied to the growing weeds when they are about six inches high. A spray pump capable of maintaining at least 150 pounds pressure should be used, with a set of nozzles arranged in a horizontal boom 6 to 12 feet long. The nozzles should be set nearly vertical and about 12 to 18 inches apart. The spray should be medium fine and penetrating. Fifty gallons should cover one acre.

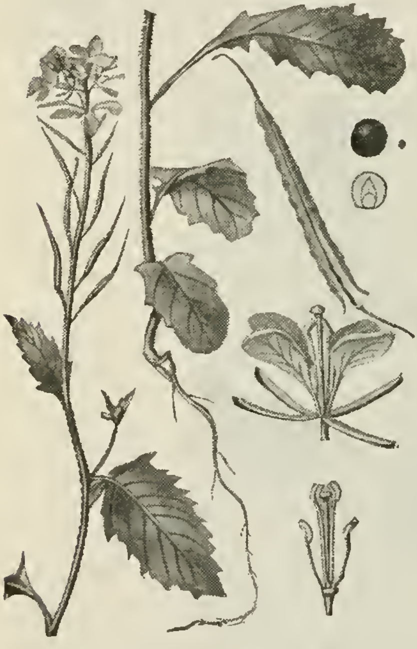

FIG. 47.—Wild mustard, *Brassica arvensis* L., commonly called "Charlock," a weed of very persistent character and rapid growth. It is not quite as common as *Brassica campestris* but is rapidly spreading. It develops later in the season than the common yellow mustard and as a result takes the moisture from the crop just when it is most needed. (Courtesy of "Farm Weeds.")

This spray will do very little damage to the growing grain because the growing point of the grain plant is protected by a sheath of leaves. The broad-leaved mustard is, however, easily destroyed by the poisonous iron sulphate and soon withers to nothing, leaving the space it occupied to be filled by grain, thus increasing the yield.

Time to Spray.

The mustard should be sprayed when it is about six inches high, and growing rapidly. The spraying in the experiment herein recorded was done on a bright, sunshiny day, followed by two days of the same kind of weather. A rain just after spraying is apt to wash so much of the material off that it will have to be reapplied. Better results will also be obtained on a still day than on a windy one, because the weeds and grain will be erect and the spray can penetrate to the lower portions of the plant with less difficulty.

To facilitate spraying, clear water should be used and the iron sulphate should be prepared a sufficient time ahead to insure a thorough mixture. On this experiment a barrel was used for mixing. As soon as the machine was loaded the barrel was refilled and contents stirred vigorously. Upon returning to reload, the mixture was again stirred and the liquid then poured into the machine tank through a cheesecloth strainer.

Other Control Measures.

Control of mustard by means of chemicals is not expected to take the place of the ordinary methods, such as crop rotation, cultivated crops, harrowing the growing grain, or hand-pulling weeds where the infestation is not too extensive. In regard to crop rotation, Professor Bolley, of North Dakota, says:

"Crop rotation must be considered as an essential of agriculture for other reasons than destroying weeds, though, if for no other purpose, it would be important to have a proper serial system of cropping. Continuous cereal farming has not been found satisfactory for the elimination of any kind of weed after it once has charge of the ground."

Too much emphasis can not be laid on the value of clean seed. The farmer should never sell his best seed and save his worst for planting. The writer again desires to quote from Professor Bolley. "It is one of the most evident facts of agriculture that the greatest present source of crop depletion is due to the use of inferior agricultural seeds."

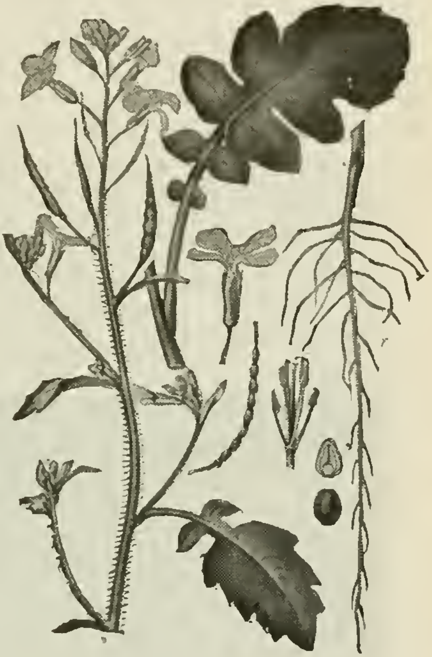

Fig. 48.—Wild radish, *Raphanus sativus* L., another member of the mustard family generally found in the grain fields during the summer. The flowers are either purple, pink or white and slightly larger than those of the common mustard. The leaves are more distinctly lobed than mustard and the pods are strongly constricted between the seeds. (Courtesy of "Farm Weeds.")

WEED CONTROL DEMONSTRATION IN YOLO COUNTY.

Under the direction of Mr. G. H. Hecke, State Horticultural Commissioner, the writer cooperated with Mr. Wm. Gould, County Horticultural Commissioner of Yolo County, in a spraying experiment for the control of wild mustard.

The iron sulphate used in the experiment was donated by the American Steel and Wire Company's branch office in San Francisco. The free use of a spraying tank was also granted by them, and grateful appreciation for the courtesy is hereby extended.

The tank was slightly small for the purpose, and as a result a strip only six feet wide could be sprayed at one time. The nozzles were placed 18 inches apart. Two different types of nozzles were used, the two outer being known as the "Friend" type, throwing a circular spray, and the two inside as the "Bordeaux," throwing a fan-shaped spray. Mr. Gould reports a marked difference in the action of the two sprays, stating that the fan-shaped spray gave the best results on the very young mustard and the circular the best on that which was older.

There was considerable difficulty experienced in securing the field for the experiment. When one was finally obtained the mustard had advanced beyond the stage where maximum results could be expected. The height of the mustard and grain was approximately 18 inches.

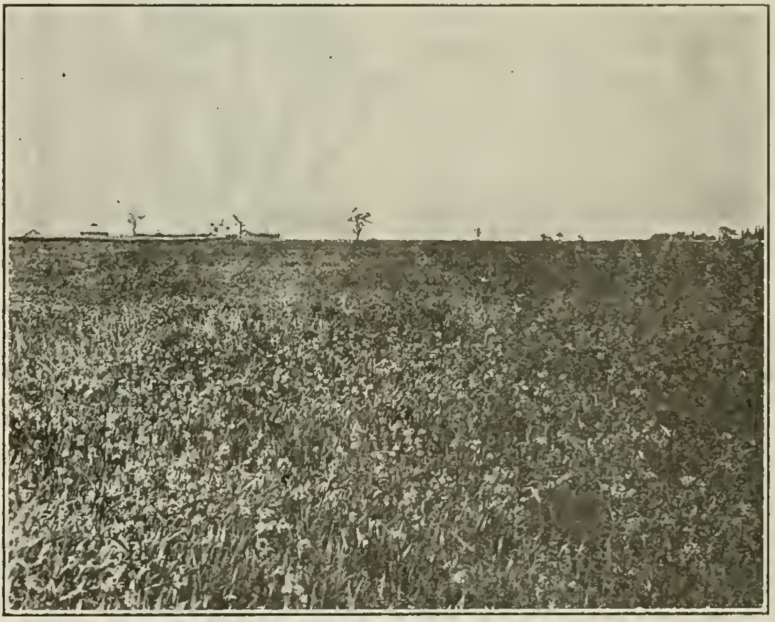

FIG. 49.—Field No. 1, at the time of spraying. The mustard is covering fully 50 per cent of the field and is about two inches higher than the grain. March 28, 1917. (Original.)

After four acres had been sprayed the owner of the field volunteered the use of another field on which the grain and mustard were only three inches high. One acre of this field was sprayed with 100 pounds of iron sulphate to the acre. The spray was directed straight down, and with a pressure in the tank of 150 pounds.

The results of the two experiments are very encouraging, and give us reason to expect that great good will come to the state through further use of this method of eradication. The results on field No. 1 show a killing of 75 per cent. As stated before, the spray was put on too late in the season. The leaves of the mustard plant which were touched by the spray were dead inside of twenty-four hours, while the grain remained uninjured. When examined three weeks after spraying, comparatively no mature seeds had developed. On field No. 2 the mustard showed a killing of approximately 90 per cent. and the small grain plants were unharmed. Fields with an infestation as heavy as was found on these areas could be sprayed twice with good results, once when the grain is very young and again at a later date.

Cost of Spraying.

The cost of spraying amounts to approximately $2.00 an acre. This however, depends upon the character of the land, the facilities for reloading, and the proximity of a water supply.

A 100- or 200-gallon tank on the spray wagon will give better satisfaction than a 50-gallon tank, because less time would be consumed in loading. On large areas a water wagon carrying 400 to 500 gallons will also be required. It would also be quite possible to use an orchard spraying machine by making such rigging for the nozzles as would be necessary for the field work.

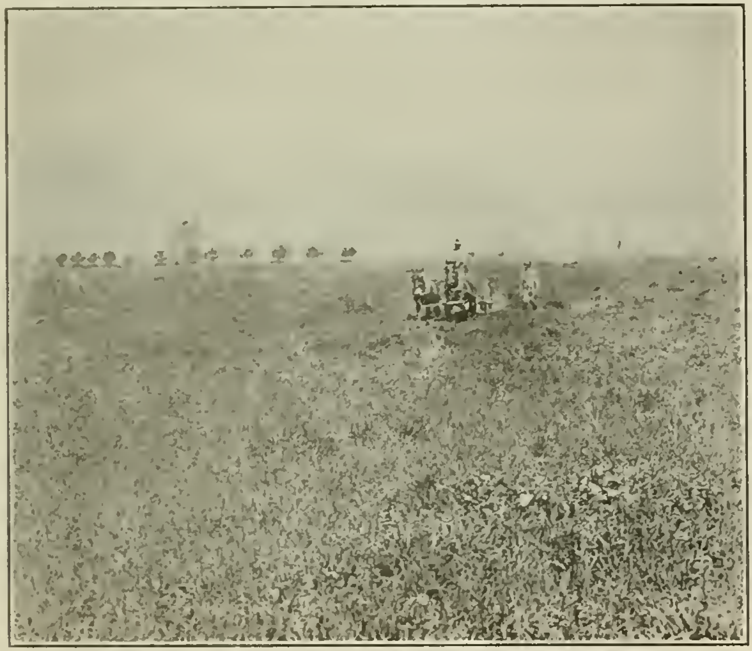

FIG. 50.—Showing the work in progress. The spray can be seen issuing as a fine mist at the rear of the machine. (Original.)

Assuming that the farmer did not do his own spraying, and that he would therefore have to hire a man and team, the cost of spraying 30 acres would itemize as follows:

Water wagon and teamster	$5 00
1 helper to keep nozzles clean	2 50
1 teamster and spray wagon	5 00
Iron sulphate for 30 acres	37 50
Total	$50 00

On fairly good ground a good spray machine should cover from 25 to 30 acres a day; this makes the cost per acre approximately $1.65. We have allowed for incidental expenses, however, and state that a good spray can be applied at a cost not to exceed $2.00 an acre.

Experimenters in the East state that two spray machines are more efficient than one and less expensive to run, since one water carrier can supply both machines. Two helpers would probably be necessary to load the chemical and keep the nozzles clean.

It is too early in the season to report on the yield from these sprayed fields, but the writer believes it would be safe to estimate a 20 per cent increase. Professor Bolley reported gains amounting to 30 and oftentimes 50 per cent. This is in actual weight of hay and grain, as compared to the unsprayed areas, and takes no cognizance of the fact that the crop is clean and would consequently be worth more. Assuming, therefore, that there is a 20 per cent gain and that the average farm produces 25 sacks of barley to the acre, the increase would amount to five sacks per acre.

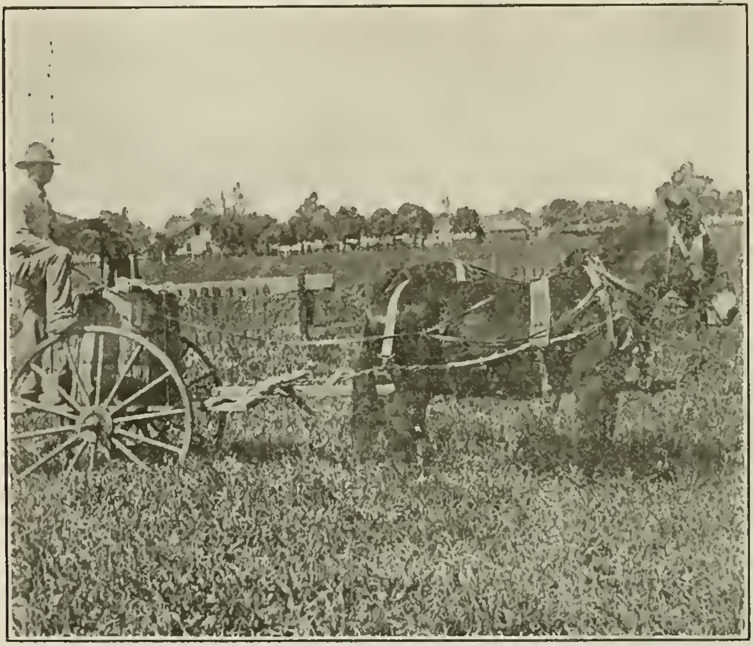

FIG. 51.—The tank used for the experiment was furnished by the American Steel and Wire Company, San Francisco, Cal. (Original.)

The Merits of the Chemical Spray Method.

The following remarks are taken from Bulletin 80 of the North Dakota Agricultural College, entitled "Weed Control by Means of Chemical Spray."

"Many have contended that even though reasonably successful in destroying weeds by means of chemical sprays, the method can not become of general use to farmers, for a number of reasons. They say it will certainly injure considerable grain; that the cost will exceed the ordinary methods; that ultimately the weeds will be too scattered to pay for the work, and, finally, the farmer will be left to cultivation and pulling. These arguments, with the exception of the possible one regarding cost, furnish their own answers. There are extended areas under grain culture, wheat, oats, barley, flax, and extended areas in pasture land, which are so thoroughly infested by seeds of certain noxious weeds that any method which may be used successfully in destroying an entire weed crop for one or more years, preventing the addition of new seeds in the soil, will be welcomed by the farmers. This chemical method of weed eradication has the peculiar merit that the weeds may be attacked while a crop is being grown and the crops will still give an increased yield. If there were no weeds at all, it is quite probable that in some cases the spraying process would reduce the yield. However, farmers will, of course, not spray a field in which the weeds are so scattering that they may be pulled by hand at a reasonable cost, without injury to the growing crop. The writer has conducted experiments on sufficiently extended scale, and over a sufficiently extended number of years, to guarantee that where ordinary weeds such as mustard, king-head, wild buckwheat and Canada thistle are sufficiently thick to make it impossible for the farmer to pull the weeds in the grain, such fields can be sprayed so as to

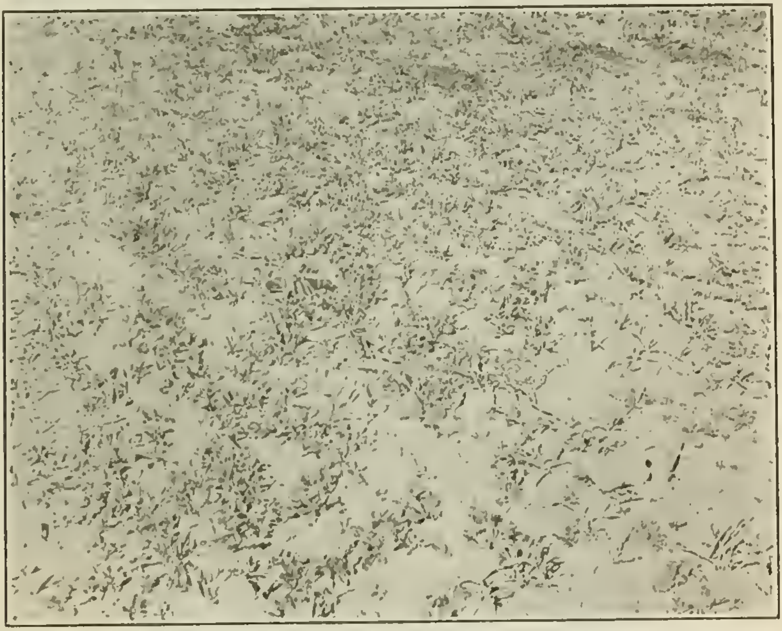

FIG. 52.—Section of field No. 2. The young mustard plants are shown covering the ground much more heavily than the grain. March 28, 1917. (Original.)

practically prevent the production of weed seeds and yet have the yield of grain materially increased. This increase of yield in the grain is brought about by the elimination of the contest between the weeds and the grain, allowing the grain, at once, after spraying, to get the full benefit of the light and air and to take charge of the ground.

"The chemical spray can be used to advantage along roadsides, in meadow lands, lawns and waste places where it will prevent the production of weed seeds and give the native and wild grasses an opportunity to gain possession of the ground. It is a well-known fact that where the weeds are kept down on the roadsides the grasses soon sod over the shallow ditches and waste places. The peculiarity of the chemical spray method is that all grasses and grains are so constituted as to withstand the spray without great injury, while the worst types of weeds, excepting only those which belong to the grass family and a few types of weeds which possess waxy or water-resisting surface, are attacked and destroyed by the solutions."

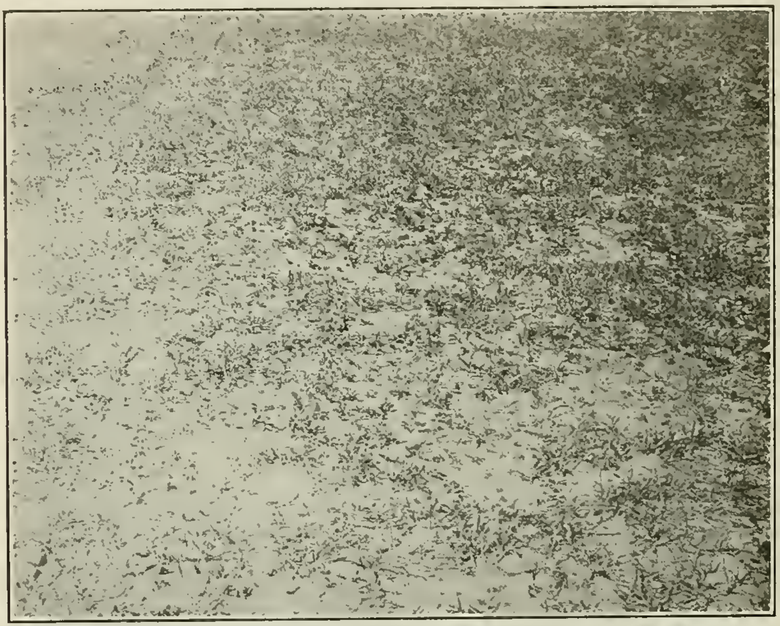

FIG. 53.—Same view as in Fig. 52, taken after the spraying. Note the withered leaves of the mustard plants and the growth of the grain. April 1, 1917. (Original.)

SAMPLING TUBES FOR MANURE, ALFALFA OR OTHER ORGANIC MATERIALS.

By A. D. SHAMEL, U. S. Department of Agriculture.

During recent years there has been a growing interest amongst citrus growers in California in the use of organic materials as mulches for citrus orchards, or for use in connection with the feeding of citrus trees. Large amounts of manure, alfalfa, bean straw or other similar organic materials are being used at the present time in California citrus orchards and the increasing demands have resulted in the raising of prices for these materials in many instances. The higher cost of these organic mulches and fertilizers has led some citrus growers to carefully consider the method of handling and using them and the comparative costliness of the different materials. Several different methods of valuing these materials have been practiced, the more common ones being the value per ton, and the value per cubic foot.

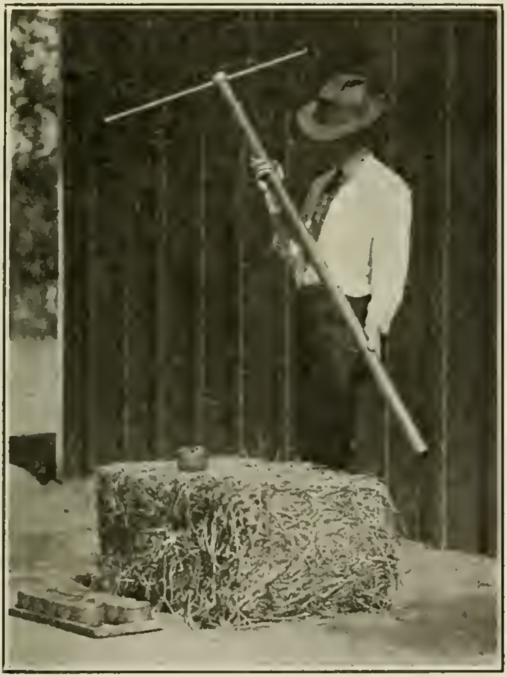

FIG. 54.—Manure sampling tube. This photograph was taken at a time when a car of manure was not available for sampling, so that it shows the manure sampling tube being used to sample a bale of alfalfa hay for the purpose of making a test of the water content of the alfalfa. The tin cans used for holding the samples during drying are the same as those used for holding soil samples, and they are used in the same way that soil samples are handled in order to determine the water content of same. The tube is about six feet long and the inside diameter is about two inches.

If the organic materials are purchased on the basis of weight, it is evident that the water content of these materials is a very important factor in determining the comparative value of the materials; for instance, in one test a comparison of the water content of two organic materials to be used for mulches showed that one of them contained 15 per cent of water on the basis of its dry weight, while the other material contained 152 per cent of water. It is evident, therefore, that in order to arrive at a fair and equitable valuation of organic materials to be used as mulches, or for other purposes in orchard work, a knowledge of the water content of these materials is desirable.

The method of securing fair and representative samples of the organic materials to be examined for water content is a practical matter, and one of considerable importance. Mr. Frank F. Chase, of Riverside, has devised a method for securing such samples, which may prove to be of interest to the citrus growers who purchase manure, alfalfa, bean straw or other such material for use in their orchards. The apparatus used for this purpose consists of a tube somewhat similar in arrangement and appearance to the King soil tube. Two different sizes of sampling tubes have been made, one for use in sampling carload or other large lots of manure, and the other for sampling bales of alfalfa, bean straw, corn stalks or other similar materials.

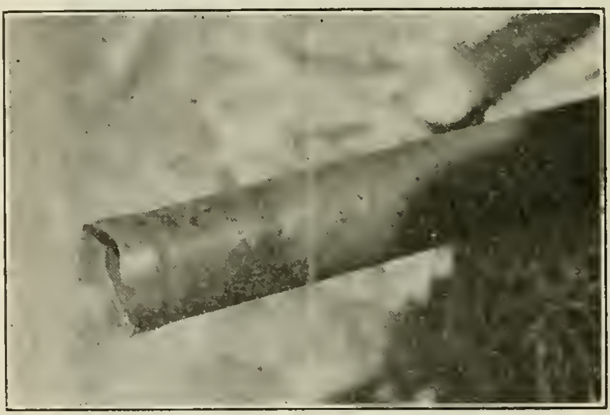

FIG. 55.—Cutting end of the sampling tube showing the arrangement of the cutting edge.

The manure sampling tube, a photograph of which is shown in Fig. 54, is about 6 feet in length and about 2 inches in diameter. One end is made with a sharp saw-tooth like cutting edge, as shown in the accompanying illustration (Fig. 55), arranged so as to cut down through the manure somewhat on the principle of the knives commonly used for cutting hay in the stack. At the other end of the tube an extra ring of metal is welded onto the tube in order to give it added support. A hole is cut through this ring and the tube so that a handle can be pushed through it for use in twisting the tube when the sample is being taken. It has been found in practice desirable to cut a sample about one foot or less in depth, then shake or push it out into a can in which it is to be dried. Another sample is then taken below the first one, and so on, until a complete sample of the manure is obtained from the top to the bottom of the pile. If desirable, more than one set of samples can be made in different portions of the pile of manure, the necessity for which will depend upon the condition of the manure. The samples are then placed in a drying oven and reduced to a dry basis. The difference in weight between the fresh samples taken from the pile of manure and their weight after drying will give the amount of water contained in them. The percentage of water can then be computed on the basis of the dry weight of the samples.

The sampling tube used for securing representative samples from bales of alfalfa, bean straw, corn stalks or other organic materials, as shown in the accompanying illustration, Fig. 56, is like the manure sampling tube excepting that it is shorter. The baled hay sampling tube is about 3 feet in length, about 2 inches in diameter and is arranged with a cutting edge similar to that of the manure sampling tube. The samples of the alfalfa, bean straw or other materials are dried in a similar manner to that used for drying the manure samples, and the per cent of water is calculated in the same way.

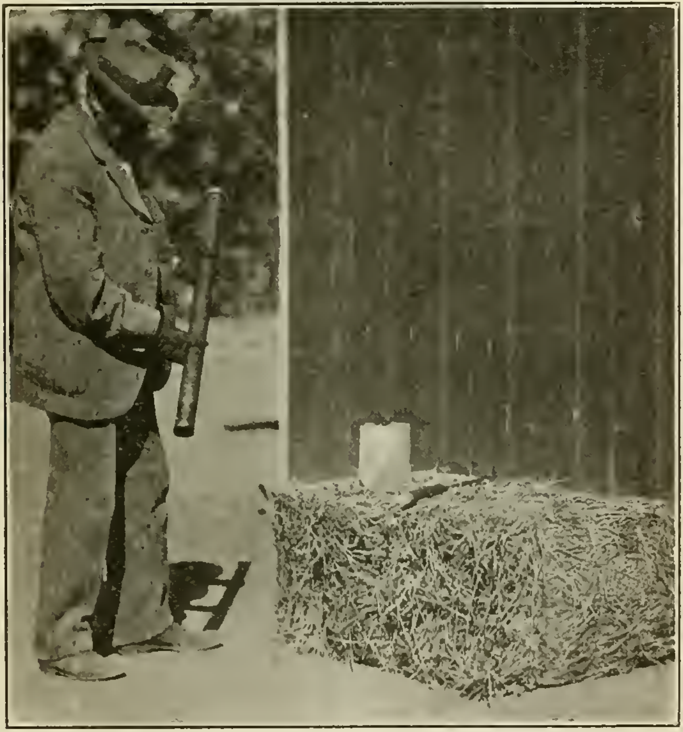

FIG. 56.—Sampling tube for alfalfa hay and other bailed organic materials.

The samples of organic materials are forced out of the tube by the use of the twisting handle. This handle is made of iron, and is dropped in at the top of the tube onto the samples in the tube until they are forced out into the drying cans.

The sampling tubes are made of iron and the cutting edges of tempered steel. The method of the use of these tubes, as suggested above, is similar to that of the use of the soil sampling tubes now in common use in many citrus orchards. It seems likely that improvements can be made in the structure and arrangement of these tubes as the result of further experience in their use. For example, it seems possible that the sampling tubes can be constructed so that after the samples have been cut the tubes can be opened so that the samples are fully exposed and easily removed from the tubes. In this event the tubes would be divided into equal longitudinal halves, arranged so that they can be opened readily, and hinged so that the two halves can be easily handled and kept in position when opened. Or it is possible that the shape and size of the tube or the cutting edge may be modified so that the samples can be more easily removed than is the case at present.

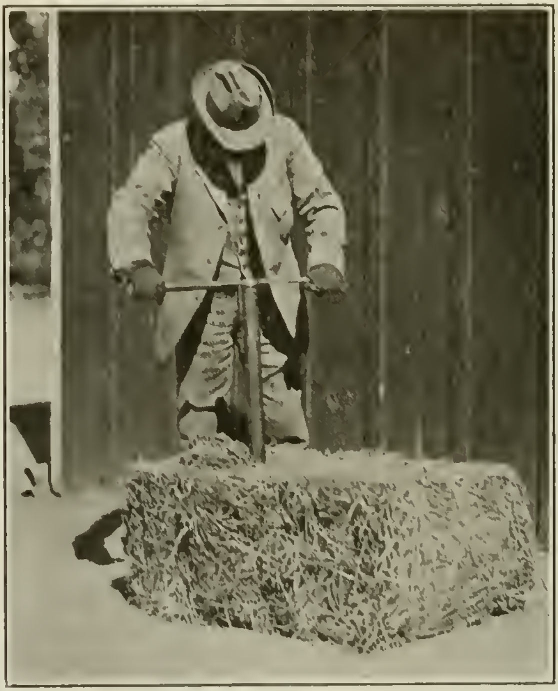

FIG. 57.—Sampling tube for baled alfalfa hay, bean straw or other similar materials, showing method of taking samples.

This description of manure and other sampling tubes is presented here in the hope of arousing greater interest in the study of a standard for the water content of organic materials as a basis for the fair valuation of manure or other materials to be used in orchard mulching or other orchard practices.

CITRUS BLAST—A NEW BACTERIAL DISEASE.

By R. W. Hodgson, University of California.

During the last few months considerable attention and study has been given to a new disease which bids fair to become of considerable economic importance in California. Several months ago Professor J. Eliot Coit of the College of Agriculture published an article on the subject in the U. C. Journal of Agriculture, in which he suggested the name "Citrus Blast." Recently there has appeared a technical article on citrus blast in the Journal of Agricultural Research by H. A. Lee. Inasmuch as the writer has been interested in this disease from the time of its first appearance and has had opportunity to study it carefully at first hand, his observations may be of interest to Monthly Bulletin readers.

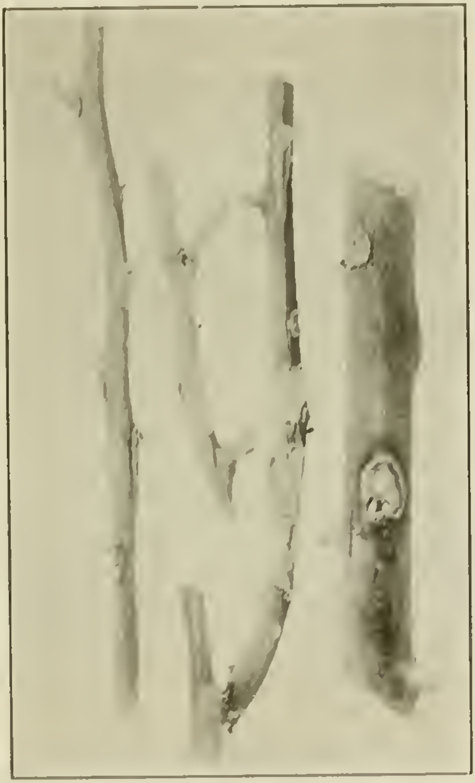

Fig. 58. Orange twigs affected with citrus blast, *Bacterium citrarefaciens* showing the characteristic lesions produced by the disease.

First Appearance.

In the summer of 1912 the writer was engaged in top working some old seedling orange trees situated about six miles southwest of Oroville. In doing this work he had occasion to cut bud-wood in an adjoining orchard and, while examining the trees, observed an apparently new and peculiar lesion on the interior sucker growth. At the time this was given little more than a casual examination. Later in the season this peculiar abnormal condition was found in several places on the other side of the Feather River in Thermalito Colony, some eight miles away, and it was realized that here was something new and of possible economic importance. Accordingly, an attempt to identify the disease was made by the writer, but without success.

As this disease did not spread to any appreciable extent during the next two seasons, due as we now know to unfavorable weather conditions, and the actual damage appeared to be slight, no further attention was given to the matter. It was known to exist, but apparently was of little importance. On several occasions material was sent for examination to the Agricultural Experiment Station at Berkeley.

On returning to Oroville in May, 1915, the writer was immediately struck by the widespread occurrence of a condition ascribed to a late frost by some growers, and characterized by others, where no frost could have occurred, as a "heavy leaf drop." On examination this condition was found to be due to neither of these causes, but was apparently the result of the same disease which had been first noticed three years before. The same peculiar lesions were prevalent throughout the mature trees on the year-old growth. During the remainder of the season the disease was studied, notes were taken as to its occurrence and external manifestations, and material was collected for laboratory examination.

Climatic Factors.

Normal winter conditions for the citrus districts of northern California are cool weather with intermittent rains, followed by short, dry, clear spells. Under such conditions the disease is not very active. The rains usually cease in February or March and there ensues a hot, dry spring and summer. However, it frequently happens that the winter rains are prolonged and coincide with the early spring growth. Such conditions are ideal for the maximum activity of citrus blast. Leaving its quiescent state, the disease becomes very active and spreads with great rapidity through the orchards, following the direction of the prevailing winds. The appearance presented is similar to that caused by a rapid blight or heavy frost.

Disease Characteristics.

Infection is apparently confined to new spring growth and seems to occur chiefly at the junction of the petiole and blade of the leaf. However, it appears that infection may also occur at the tips of the very young leaves and tender shoots. Once established, the disease progresses rapidly down the shoot toward the older wood. Only the new tender growth is affected, the older limbs apparently possessing greater resistance. The young shoots are often killed back to the older wood, including a portion of the bark about the base of the infected shoot. At these points the characteristic lesions are formed. It is not unusual to find a branch several feet long with every node affected in this manner. Upon infection, the leaf turns pale yellow, then darkens irregularly in spots and wilts in place, where it later shrivels and dries, still hanging to the shoot. If the disease is virulent and conditions favorable, it may attack small branches of the previous season's growth, killing them back to a distance of several feet. The dead area about the base of the infected leaf or shoot varies greatly in size and is ordinarily more or less irregular in shape, frequently extending some distance along the stem. (See Fig. 58.) In the case of younger growth, girdling is apt to occur and the shoot dies back to this point. The rapidity with which the disease spreads is remarkable and only a few days of the proper weather conditions are required for serious damage.

As the dry season approaches, activity is retarded and in midsummer the disease is apparently quiescent. The wilted shoots and leaves shrivel and dry. At this season there may appear a veritable herbaria of various fungi, among which are the common withertip, *Cladosporium* and gray mold. The line of separation between healthy and infected tissue becomes very clear-cut and definite. Frequently in early summer, a pinkish, resinous gum is exuded from the lesions. These, as well as all the dying or dead tissues, take on a characteristic dark color and are sunk below the surface of the healthy tissue. This dead wood, as it dries, becomes very hard and tough. The healing process begins, and in the wounds callous material is developed which raises the dead tissue up in the form of scabs. These are sloughed off in the course of time, leaving very characteristic scars which may be visible for several years.

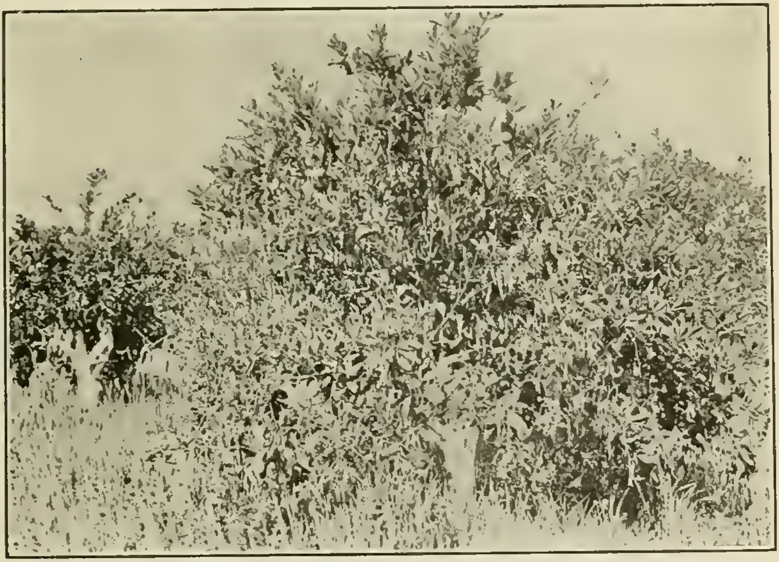

Fig. 59.—Orange tree affected with Citrus blast, *Bacterium citrarefaciens*. The photograph was taken in the late spring. Note the shriveled leaves still hanging on the tree.

A peculiarity noted is that the infection frequently does not seem to penetrate through the bark into the wood. Indeed, in some the cambium layer is not killed, which is evidenced by the formation of callous material in the center of the lesion as well as about the edges. Where trees containing a large amount of weak, twiggy, interior brush are badly attacked, there is a peculiar result. The bark of the twigs rots away, leaving the tree full of dead white twigs which may persist and not decay for several years.

Later in the season the effects of the disease are masked by the new growth. To find it at this time, one must examine those branches under three-quarters of an inch in diameter for the presence of the cankers.

Causal Organism.

From the time of the discovery of the disease, all the indications have pointed to a bacterial causal organism. In fact, the resemblance in its effects to pear blight is very striking. (See Fig. 59.) Mr. H. A. Lee, formerly of the University of California and now stationed at Washington, D. C., has worked on this disease, using material sent in from various parts of the state, and has isolated the causal organism, a bacterium, which he calls *Bacterium citrarefaciens*. He finds that the bacteria exists chiefly in the parenchyma tissue, destroying the cell structure, and that they do not ordinarily invade the vascular tissues. He has further succeeded in isolating the bacteria from material which has spent the summer in a dried condition, establishing the fact that the disease may exist over the summer in the dead wood.

Distribution.

Citrus blast was reported at Oroville, Palermo, Wyandotte and Orland in 1914. Since that time it has apparently spread rapidly both north and south, having been reported as far south as Porterville.

Inasmuch as this disease first manifested its economic importance in 1915, at which time it was confined to two local areas, its spread must be considered very rapid and, as it is so new and little known to orchardists, it is quite possible that it may have a much wider distribution than is now suspected. As yet no report of this trouble has come from the southern California citrus district.

Reduces Fruit Wood.

Citrus fruit is produced on wood of the current season's growth. This puts out in early spring, bearing the fruit buds which open in April. As has been stated above, under favorable moisture and temperature conditions this tender new growth may be very seriously attacked by citrus blast. Depending on the stage of growth in this new wood, the character of the damage varies. Attacks early in the season may kill all this fruiting brush back to the old wood, but if weather conditions change it may be killed back only part way.

In the event that the first named condition occurs, new fruiting brush must be grown, and this draws on the reserve food and strength of the tree. Blooming is delayed several weeks and the normal processes of nutrition in the tree so weakened and disturbed that the proportion of fruit "setting" may be reduced.

If the new wood is only killed back part way, a resprouting of the uninjured portion occurs which, while not delaying blooming so long, may have the same general effect as the damage in the previous case. In addition, this resprouting may result in an abnormal clustering of the flowers, which is not desirable.

It very frequently happens in northern citrus districts that the trees are in bloom when conditions occur which are favorable to the disease.

Sometimes the flowers are attacked and killed, in which case no compensatory growth occurs. Thus depending on the time of the attack, the blooming period may be seriously reduced and the flowers may be killed, all of which reduces the crop to a greater or less extent.

So serious do some growers consider this disease that preventive and control measures are now being tried out. One of the growers in the northern citrus district who has a large acreage is now using pear blight control methods in an attempt to eradicate the disease. We may expect, since it is of a bacterial nature, that efficient control will be difficult. At the present time the best practice seems to be careful pruning out of infected branches in early summer when the diseased areas are readily seen, and carefully burning such prunings.

THE ALFALFA WEEVIL AND THE MENACE OF TIA JUANA.

By H. V. M. Hall.

The fact that Tia Juana, Mexico, is just across the border stimulates business in several San Diego offices. The police and the district attorney put on extra men as soon as the race track season opens, and, strange as it may seem, the local quarantine inspector expects and finds more trouble than usual at about the same time.

I have often wondered why a good horse and a no-account man are so often together. Perhaps it is the same reason that good horse feed, namely alfalfa hay, is associated in the minds of the horticultural quarantine service with a very "ornery" bug, namely *Phytonomus posticus*, alias the alfalfa weevil. Anyway, the first three—good horse, no-account man, and good horse feed—hang around San Diego together, and the fourth, that is, the "ornery" bug, is apt to join them in spite of the inspector. The following incidents include items of interest illustrating the economic and strictly entomological possibilities of the Tia Juana race track. I will leave the moral, legal, and social possibilities and actualities to specialists in their line.

On the twentieth of October, 1916, I put in a full day. (I do so every once in a while, but this is one that I had cause to remember.) A car of emigrant movables arrived here from Utah. That doesn't have anything to do with Tia Juana, but it illustrates what happens when hay comes in from Utah. The farmer was "somewhere on the road" by auto, so he couldn't be consulted. The hired man was in charge of the car, which, by the way, contained two horses, a cow, wagons, furniture, etc., and 24 bales of alfalfa hay grown and loaded at Milford, Utah. The State Quarantine Law and Order No. 20 (then in force) made it plain to the hired man that he would never get the good out of that hay. "At once destroyed or returned to the shipper" is the way the order read. The cost of returning the hay to Utah would have been prohibitive, and the shipper was coming along, so that left destruction as the only way out.

The hired man informed me that he was "broke," and that the owner wasn't expected for four or five days. He couldn't handle all that hay himself in the course of one day. I couldn't let him put in more time at it, for a steamer was promised for the next day from Mexico, and besides, I had to see that all the hay was burned, not saved for somebody else to use, or smuggled back into the car. So it looked as if I was elected to help the hired man destroy the hay, so we did it, and it took all day. It also put a thorough respect for the state quarantine law into the minds of the railroad employees, and located a lot of muscles for me that I had forgotten all about. The car was "spotted" on a siding near the city incinerator, and the rest was just plain work of the strong back variety.

Four days later a car of race horses from Montana, via Utah, arrived here. The man in the car bewailed his hard luck, for he had intended to load up with hay at Milford, Utah, and he got in there on Sunday afternoon, and everything was closed. When I told him what happened to half a car of hay from Utah four days before, he became more cheerful. When I went on to explain the matter, he volunteered to telegraph his partner (which he did) not to get his hay in Utah.

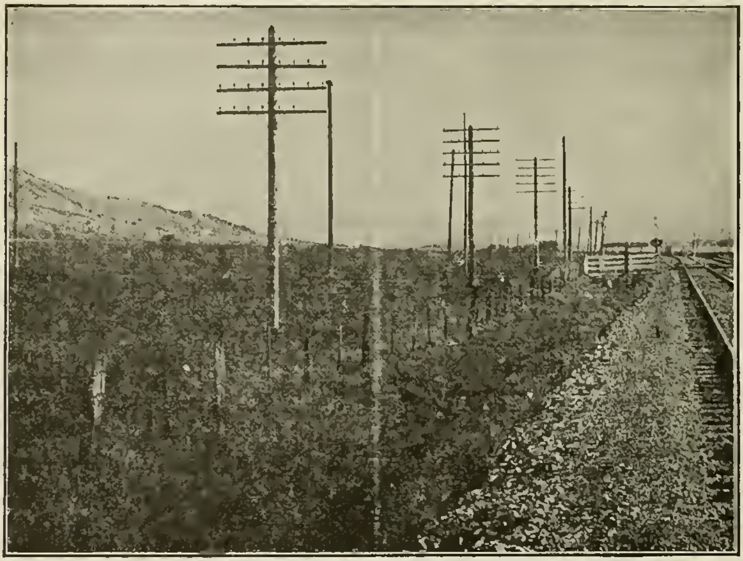

Fig. 60.—Volunteer alfalfa growing along the right of way of the Oregon Short Line Railway. Stands of alfalfa such as this can be found in any section of southern California. Railroad rights of way should be inspected every season for possible infestations of the alfalfa weevil. (After Webster.)

On the nineteenth of November, 1916, a car of horses arrived from Richfield, Utah. On arrival the "personal conductor" of this car informed me that he had cleaned out the car in the yard at San Bernardino, and offered the further information that he had "throwed stuff out all along the road." Of course these facts were promptly reported to the proper authorities, who doubtless cleaned up as far as possible after this careless "caretaker." But what about the "stuff throwed out all along the road"? Truly there is a reason for the annual railroad right of way inspection lest *P. posticus* be already among us unaware.

With these things in mind I made a trip to Tia Juana to find out what conditions were there. Hay, if sent out of the state to Tia Juana, Mexico, is out of the state only half a mile at most. Also, the citrus growers of Chula Vista and other near-by points haul the litter from the race track into their groves. So in case a carload of horses and hay gets this far through the state, and the owner takes as his option under Quarantine Order No. 29 the "immediate sending of same out of the state" (to Tia Juana, Mexico) rather than destruction, which would be just what he would choose, as he is on his way there, the intent of the order, namely keeping *P. posticus* out of California, is thereby made of no effect.

This constitutes the menace of Tia Juana, entomologically speaking, and the only way to guard against it is to enforce Quarantine Order No. 29 at the state line across which such cars enter California from Utah and other infested states, rather than at destination, or near destination as heretofore.

FRUIT EXHIBITS AT THE ROYAL EASTER SHOW, SYDNEY, NEW SOUTH WALES.

By E. J. Vosler.

Easter time is looked forward to with a great deal of anticipation in Australia, and particularly in New South Wales, for it brings with it the annual show of the Royal Agricultural Society of that state, as well as a series of holidays, which it seems the Australians are given to taking whenever the slightest excuse is found. In fact, one often wonders when they take sufficient time to work. But as I am to describe the show, and particularly the horticultural exhibits, I will say nothing further regarding their playtimes.

The Royal Easter Show has its own permanent grounds and resembles very closely our state fairs. There were exhibits of live stock, of all kinds and descriptions, grains, grasses and other agricultural crops, farm machinery, household appliances and the usual commercial exhibits. There were horse races and ring events and other amusements which are always well attended.

The live stock exhibits were naturally the most extensive, as this is the prime industry of New South Wales, and even the whole of Australia, for that matter. The exhibits of farm machinery were good. The writer noticed the Big Bull tractor on exhibition, it being the only tractor there of the kind that we see in our California orchards. There were several of the larger traction engines on display. The exhibits of household utilities were worthy of commendation, but nothing further need be said concerning them except that they did not differ much from those that we see at home. Perhaps we arrange and decorate our booths a little more tastefully than they do.

Horticultural Exhibits.

Owing to the lack of proper cold storage facilities, or the proper preparation of the out-of-season fruits, or both, only those fruits which were in season at the time of the show, generally speaking, were displayed, which is unlike our California fairs, where one sees all sorts of fruits, no matter what the season. With the development of the fruit industry in Australia through more extensive plantings, better selection of varieties, better methods of packing and marketing, cooperation between the producers and the needed development of the proper transportation facilities, including quicker dispatch, cold storage, etc., the fruit exhibits can not fail to improve.

Apples predominated at the show and some very fine specimens of this fruit were exhibited. Those apples packed for export were very carefully graded, and a word of praise is due the packers. In fact, it looked like the packers had taken lessons in California. The following are some of the varieties that were on exhibition: Carrington Red, Cleopatra, Jonathan, Munroe's Favourite, Rome Beauty, Stone Pippin, King David, McIntosh Red, Northern Spy, Newtown Pippin, Delicious, Gravenstein, Granny Smith, London Pippin and Dunn's Favourite.

Pears came next in point of numbers displayed. I did not see our old friend the Bartlett, but may be it was there under another name. The quality of the pears I have tasted so far in Australia is excellent. The pears on exhibition were as follows: Josephine de Malines, Kieffer, Packham's Triumph, Howell, Vicar of Wakefield, Williams (Bartlett),* Winter Cole, Winter Nelis, Beurre Easter, Beurre d'Anjou and Beurre de Capiaumont. Like the apples, the pears marked for export were very carefully selected and packed. Here, as in California, you have to go outside to get good fruit, the poor fruit being dumped on the home markets.

The following persimmon varieties were displayed: Dia Dia Nura, Hay Cheya, Kuro Kumo, Zenje Maru, Denzi Maru.

The plum exhibit was almost minus the common California varieties, the Satsuma and Japanese plums being the only ones displayed, but the quality, if not the quantity, was there.

The grape exhibit was small and not to be compared with those we see in any county fair in California. The Muscats, both black and white, were present, as well as the Black Hamburg, Gordo Blanco, Waltham Cross, Triviana, Dorradilla and Muscat of Alexandria. The bunches were of good quality and the grapes in the bunches were of uniform size.

Only a few specimens of grapefruit were shown, but appeared to be good enough to eat.

The citrus exhibit was disappointing, and to anyone not familiar with the country would have created a bad impression, but the season for citrus, particularly oranges, was just approaching, so that the show came too early for this fruit. The oranges were almost all green, of small size and the skins were covered with blemishes. New South Wales certainly produces better oranges than those exhibited at the show. The entire citrus exhibit did not cover more than 250 square feet of space.

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*The Williams pear listed is the same as our own Bartlett. The latter name was given to the pear in this country after its introduction from Europe, where it is commonly known as Williams Bonchretien. [Editor.]

There were several plates of oranges labeled "Common," a variety unknown to the writer. There were also plates labeled Navel oranges, Washington Navel and Seville. A few Mandarins were displayed and were of nice appearance. The varietal names were Emperor and Thorny. The principal lemons exhibited were the Lisbons. Some of the lemons were beautiful in appearance, with fine skins; others were very inferior and oversize.

Only a few peaches were shown, but they were of good quality. The varieties were Red Italian, Salway and Pullar's Cling.

Figs, walnuts, passion fruit, bananas and pineapples were displayed in small quantities—just sufficient to show that they can be grown in good quality.

The Department of Agriculture for New South Wales had some very nice dried fruits, including apples, pears, prunes and peaches, and several district booths also displayed well-packed dried specimens, but the quantity was nowhere near the California standard.

Judging from the fruit exhibit as a whole, Australia can produce quantities of good quality fruit of all kinds, and she may well be proud of her fruit industry. The fruit growers have had many things to contend with, one being long distances from foreign markets, but an era of prosperity is certainly before them if intelligent efforts are made.

CROP REPORT AND STATISTICS

MONTHLY CROP REPORT.

(May 1, 1917.)

By Geo. P. Weldon.

Compiled from the reports of the County Horticultural Commissioners.

County	Almonds (per cent)	Apples (per cent)	Apricots (per cent)	Berries (per cent)	Cherries (per cent)	Figs (per cent)	Grapefruit (per cent)	Lemons (per cent)	Olives (per cent)	Oranges (per cent)	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	35	—	45	90	35	—	#	#	#	#	30	60	—	—	—
Butte	15	—	#	100	80	100	100	100	100	100	20	80	45	40	#
Colusa†	100	100	75	#	#	—	#	—	#	—	#	100	100	100	100
Contra Costa	60	100	50	—	50	—	—	—	—	—	90	120	25	70	#
El Dorado	#	100	#	#	80	#	#	#	#	#	90	100	90	90	#
Fresno	#	#	60	#	#	100	#	—	—	30	90	#	#	—	#
Glenn	70	90	50	80	#	#	#	—	#	—	60	75	#	80	#
Humboldt	#	90	90	100	90	#	#	#	#	#	95	90	90	#	#
Imperial	#	#	100	#	#	#	#	#	#	#	#	—	#	#	#
Inyo	#	50	25	100	50	#	#	#	#	#	25	50	75	75	50
Kern	25	100	40	#	#	100	#	#		—	60	100	75	80	#
Kings	#	#	60	#	#	#	#	#	#	#	80	#	#	100	#
Lake	50	100	50	#	#	#	#	#	#	#	#	120	#	100	#
Los Angeles	50	100	45	100	—	90	100	85	75	100	80	100	80	—	85
Madera	100	—	30	—	#	—	#	#	—	#	100	#	100	90	#
Marin	#	100	105	90	—	#	#	#	#	#	90	100	95	95	#
Mendocino	#	100	100	#	100	#	#	#	#	#	100	125	100	110	100
Merced	75	#	60	#	#	—	#	#	100	#	100	100	100	#	#
Monterey	—	90	80	70	—	—	#	#	—	#	95	80	75	75	#
Napa	20	90	25	—	60	#	#	#	#	#	100	100	70	80	#
Nevada	0	80	0	100	60	—	#	#	#	100	66	100	75	75	—
Orange	#	#	105	100	#	#	100	100	—	100	100	100	100	100	100
Placer	75	90	70	90	70	—	#	#	—	—	70	90	33	#	#
Riverside	70	100	50	#	60	#	100	100	100	90	85	100	#	100	100
Sacramento	35	100	90	110	100	#	#	—	—	—	110	110	90	75	#
San Benito	100	100	75	—	100	#	#	#	#	#	100	100	#	100	100
San Bernardino	50	100	100	100	100	—	100	100	—	95	100	100	100	100	90
San Diego	90	100	10	100	100	100	100	70	90	100	100	100	100	100	100
San Joaquin	100	100	90	—	100	—	#	#	—	#	100	90	100	100	75
San Luis Obispo	75	80	95	#	110	#	#	#	#	#	90	100	#	95	60
Santa Barbara†	#	100	100	#	100	#	100	100	100	100	100	100	100	100	100
Santa Clara	#	90	35	100	45	#	#	#	#	#	80	65	—	100	#
Santa Cruz	#	100	85	90	60	#	#	95	#	#	90	95	90	80	#
Shasta	10	75	10	75	40	75	#	#	100	#	45	75	50	75	#
Siskiyou	#	100	#	100	100	#	#	#	#	#	100	100	100	100	100
Solano‡	10	#	50	—	60	#	#	#	#	#	50	100	75	75	—
Sonoma	75	75	25	100	50	#	#	#	—	#	100	100	50	60	#
Stanislaus	100	100	90	75	100	50	—	—	—	100	100	100	100	100	100
Sutter	65	—		#	—	—	#	#	—	#	70	—	—	75	—
Tehama	50	—	50	20	—	—	#	#	—	—	75	100	100	100	—
Tulare	#	90	25	90	#	—	—	—	—	—	80	#	100	100	#
Ventura†	—	#	70	#	#	#	#	90	—	—	#	#	#	#	—
Yolo	40	100	45	—	60	100	#	100	100	100	30	100	75	100	100
Yuba	70	100	50	100	75	100	#	100	100	100	80	100	80	80	100
State average	58	93	57	-----	68	94	-----	91	96	94	83	99	60	91	91

Figures indicate condition of crop in per cent on the basis of 100 as normal.
—Horticultural commissioner has insufficient information for a report.
#Not grown commercially.
†No report received since April 1.
‡Report by J. W. Mills, farm advisor.

STATISTICS.

Estimated per cent of the total crop of the principal California fruits grown in each of the main producing counties during a season of normal production. Compiled from the reports of the county horticultural commissioners, 1915.

County	Almonds (per cent)	Apples (per cent)	Apricots (per cent)	Cherries (per cent)	Figs (per cent)	Lemons (per cent)	Olives (per cent)	Oranges (per cent)	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	*		14	9						2	*	*	
Butte	12	*		*	8	*	14	*	8	2	*	2	
Colusa	4		*						*	*		*	
Contra Costa	11	*	*	*					*	6	*	*	
El Dorado		*		*					*	3	*		
Fresno			5		53	*	3	*	29			*	
Glenn	*		*								*		
Humboldt		2											
Imperial			*		*								
Inyo		*							*				
Kern		*	*					*	*	*	*	*	
Kings			5						8			*	
Lake	*	*	*						*	2		*	
Los Angeles	2	2	4		*	31	14	26	4	*	3	*	30
Madera	*	*	*		3		2		*			*	
Mendocino		*								*		*	
Merced	*		*		9		*		8				
Modoc													
Monterey	*	12	2	*						*			
Napa	*	*	*	*	*		*		*	4	*	4	
Nevada		8	*	*					*	*	*		
Orange			4			7		10					38
Placer	*	*		3	*		*		6	7	39		
Riverside	3	*	7	*		16	11	14	*	*		*	
Sacramento	6		*	5			5	*	*	18	3	*	
San Benito	*		6	*					*	*	*	3	
San Bernardino		4	4	*		13	7	31	5				2
San Diego	*	*	*			10	5	*	*				
San Joaquin	12		3	25	*		4		8	4	*	*	
San Luis Obispo	*	*	*										
Santa Barbara		*	*	2		*	2						10
Santa Clara	*	*	21	26	*				5	9	18	55	
Santa Cruz		51	3	2					*			*	
Shasta	*	*					*		*	*		*	
Siskiyou		*											
Solano	5		3	10					8	6	16	4	
Sonoma	*	16	*	9	*		5		*	6	*	12	
Stanislaus	6		*	*	5			*	3	*			
Sutter	9				8		*		2	*	*	*	
Tehama	*	*	*		*		11	*	*	2	*	*	
Tulare	*		*		5	5	6	13	9		2	4	
Ventura			6			15		2					20
Yolo	11		5		5		3		2	9	4	2	
Yuba	*				2		3	*	*	*	*		

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*Less than 2 per cent of state's normal crop grown in county.

THE ACREAGE OF FRUITS BEARING AND NONBEARING BY COUNTIES IN 1916—REVISED TABLE.

By Geo. P. Weldon.

Because of the fact that a number of errors, especially in totals, due to faulty manipulation of an adding machine, occurred in the acreage table published on pages 116 and 117 of the monthly bulletin for March and April, 1917, a revised table is being printed herewith.

ACREAGE STATISTICS

County	Almonds		Apples		Apricots		Berries		Cherries		Figs		Lem
	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing
Alameda	385	10	130	------	3,905	1,033	138	------	757	34	------	------	10
Butte	3,508	1,218	462	306	34	7	80	------	61	38	75	25	25
Colusa	300	3,500	------	------	30	15	------	------	------	------	20	------	------
Contra Costa	1,860	1,100	160	100	550	320	20	20	220	120	20	8	5
El Dorado	------	------	350	225	------	------	------	------	80	40	------	------	------
Fresno*	------	------	250	30	2,137	613	------	------	------	------	2,919	------	75
Glenn	150	2,380	78	140	200	350	50	------	------	------	------	350	58
Humboldt	------	------	1,500	510	------	------	90	------	------	------	------	------	------
Imperial	------	------	------	------	197	248	50	------	------	------	76	125	17
Kern	30	160	100	2,025	230	245	------	------	------	------	14	97	------
Kings	------	------	------	------	2,118	457	------	------	------	------	------	------	------
Lake	118	329	255	10	31	2	20	------	10	1	10	------	------
Los Angeles	437	64	1,300	720	2,054	1,500	7,764	626	------	------	101	72	4,379
Madera	50	10	200	15	200	50	20	------	------	2	100	315	1
Mendocino	25	------	615	715	30	45	------	------	50	25	20	25	------
Merced	450	1,000	50	25	250	90	50	------	8	7	625	1,315	16
Modoc	------	------	360	235	83	55	50	------	15	------	------	------	------
Monterey	12	160	2,600	800	510	720	120	------	10	30	2	------	------
Napa	170	97	450	172	178	197	65	12	360	165	50	8	22
Nevada	20	------	1,000	269	15	7	60	2	50	4	20	5	------
Orange	------	------	133	225	1,100	200	200	------	------	------	------	------	3,200
Placer	250	116	450	20	45	13	500	------	350	78	------	------	20
Riverside	983	562	904	2,907	3,328	4,823	18	------	44	415	19	12	2,700
Sacramento	1,250	765	425	80	500	70	2,100	------	420	220	10	------	25
San Benito	125	60	325	125	1,500	1,300	600	------	70	10	------	------	------
San Bernardino	1	44	1,492	6,904	1,064	763	68	------	54	130	10	------	2,943
San Diego	85	21	1,110	417	113	267	------	------	8	20	10	16	3,126
San Joaquin	1,200	600	50	30	1,000	------	------	------	1,800	600	80	25	------
San Luis Obispo	214	3,399	308	592	104	363	------	------	2	30	------	------	------
Santa Barbara	------	------	410	140	150	130	------	------	160	130	------	------	910
Santa Clara	258	80	400	443	8,561	457	1,000	------	1,970	2,000	39	21	31
Santa Cruz	------	------	15,800	900	1,300	1,000	500	------	150	250	------	------	15
Shasta	36	------	229	57	10	11	125	10	5	10	7	6	------
Siskiyou	3	1	675	350	10	------	100	------	50	25	------	------	------
Solano*	1,000	415	------	------	1,300	150	------	------	700	300	------	------	------
Sonoma	108	40	5,379	3,136	599	133	1,600	------	714	472	79	------	9
Stanislaus	1,610	1,050	120	7	425	520	120	------	40	30	360	50	8
Sutter	1,500	1,181	157	20	20	------	------	------	42	43	179	------	------
Tehama	500	350	500	50	200	20	------	------	------	------	50	100	------
Tulare	50	250	415	165	425	375	33	35	15	20	625	660	820
Ventura	143	85	------	------	2,471	2,850	------	------	------	------	------	------	3,506
Yolo	3,500	1,100	30	------	1,900	25	260	------	------	------	300	15	------
Yuba	145	65	430	85	100	35	150	60	25	25	150	225	25
Totals	20,476	20,212	39,602	22,950	38,977	19,459	15,953	765	8,240	5,274	5,970	3,475	21,946

*1914 figures.

BY COUNTIES.

ons	Olives		Oranges		Peaches		Pears		Plums		Prunes		Walnuts		Totals of counties, exclusive of grapes
Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	Bearing	Non-bearing	
------	41	------	18	------	40	------	450	232	128	15	1,855	585	154	------	9,920
40	1,700	2,160	1,650	113	1,945	210	175	285	35	65	2,530	3,188	25	100	20,060
800	------	------	40	900	300	100	30	20	10	20	1,200	3,500	40	50	10,875
5	143	2	10	5	600	320	650	1,100	80	62	1,100	350	30	1,320	10,480
------	------	------	------	------	300	325	500	1,000	300	550	20	------	20	30	3,740
------	502	------	1,788	------	35,000	------	------	------	343	------	981	------	159	------	44,797
350	45	450	75	2,500	110	2,460	27	580	------	------	210	840	------	150	11,553
------	------	------	------	------	75	30	40	100	------	------	75	------	30	465	2,915
23	52	143	102	165	77	168	67	83	------	------	------	------	------	------	1,583
130	40	860	450	920	660	450	190	1,025	50	120	200	470	5	260	8,731
------	------	369	------	------	7,183	301	------	------	------	------	1,109	375	------	------	11,912
------	55	1	------	------	150	60	500	2,300	------	------	500	725	100	692	5,869
3,744	1,411	204	21,854	9,235	3,102	3,716	550	3,233	785	415	230	227	9,763	6,500	83,995
------	200	600	10	------	1,000	500	15	5	10	45	65	65	1	49	3,728
------	------	------	------	------	150	165	825	950	35	30	450	675	------	------	4,330
10	150	207	45	40	4,600	750	75	33	35	75	20	129	35	85	10,175
------	------	------	------	------	27	20	14	12	20	4	8	2	------	------	905
------	------	------	------	------	100	------	90	115	------	------	40	25	5	15	6,354
22	200	2	23	24	500	80	440	396	100	104	4,000	1,586	180	95	9,698
------	5	------	10	------	350	215	650	1,508	110	258	90	------	20	93	4,761
3,000	160	------	10,110	8,000	75	75	5	20	25	------	------	------	11,850	2,000	40,378
------	320	------	314	16	7,500	352	1,800	800	6,000	700	------	------	------	------	19,644
2,466	1,340	530	16,968	2,876	2,083	1,204	306	600	36	38	466	120	420	1,799	47,967
20	794	780	1,030	730	1,975	915	3,100	1,970	1,435	640	740	850	25	140	20,989
------	------	------	------	------	525	225	250	400	------	------	2,500	1,000	25	65	9,105
2,655	599	729	33,059	8,602	6,231	1,762	130	974	44	48	18	44	501	1,013	69,882
2,071	1,500	81	1,491	149	503	442	118	226	17	83	48	74	116	268	12,380
------	600	300	------	------	7,000	2,000	800	800	500	300	600	700	200	1,000	20,185
------	------	------	------	------	36	414	108	2,110	3	18	192	1,028	313	208	9,442
345	440	105	------	------	5	7	20	------	------	------	------	------	4,800	800	8,552
120	1,600	51	20	12	5,300	200	1,530	223	2,987	153	61,611	4,722	641	259	94,589
------	------	------	1	------	100	------	50	325	------	------	300	------	------	------	20,691
------	140	330	6	4	400	600	100	22	25	260	856	333	37	56	3,674
------	------	------	------	------	180	30	44	15	60	45	20	5	5	16	1,633
20	20	------	10	20	4,200	600	1,000	230	2,521	1,520	4,345	1,800	------	------	20,151
3	650	------	108	16	807	421	1,149	609	107	58	8,905	447	357	293	26,199
3	100	200	120	75	3,846	450	120	90	55	125	75	250	30	520	10,399
------	50	25	------	------	2,572	3,256	221	169	80	3	787	2,041	15	239	12,600
------	1,000	300	137	219	3,877	700	370	350	100	100	664	558	------	------	10,145
600	1,250	2,760	21,400	21,100	7,850	1,120	65	35	500	240	2,650	3,150	120	200	66,930
2,136	1,207	27	2,661	1,470	------	------	------	------	------	------	------	------	5,067	1,583	23,206
------	450	75	60	15	1,950	100	900	------	600	150	1,450	225	40	10	13,155
10	450	900	160	50	750	350	600	406	300	125	280	375	250	200	6,720
18,573	17,114	12,391	113,729	57,256	114,034	25,093	17,764	23,325	17,436	6,369	101190	30,464	35,379	20,581	833,997

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical and other publications of a similar nature.

G. H. HECKE, State Commissioner of Horticulture------------------------------Censor
GEO. P. WELDON, Chief Deputy Commissioner---------------------------------Editor

ASSOCIATE EDITORS.

H. S. MADDOX------------------------Secretary State Commission of Horticulture
HARRY S. SMITH------------------------------------Superintendent State Insectary
FREDERICK MASKEW-------------------------------Chief Deputy Quarantine Officer
O. W. NEWMAN----------------Assistant Secretary State Commission of Horticulture

Entered as second class matter December 29, 1911, at the post office at Sacramento, California, under the act of June 6, 1900.

The Monthly Bulletin.—I am much gratified at the numerous warm expressions of approval concerning the contents of the combination number three and four of the Monthly Bulletin, and, indeed, much care was given by the editor and his associates to the selection of its material. The following number is merely a delayed report of the forty-ninth fruit growers convention held at Napa. Unfortunately, our printing fund did not permit an earlier issue. The number now before our readers is modest, but contains much that will prove to be of value to the commissioners and to the fruit interests. We expect, however, to present our readers with an especially good, well illustrated, and interesting issue in the next number, to be designated as The Special Quarantine Number. Some of the writers and their topics are as follows:

Prof. Wilmon Newell, Florida Plant Commissioner; Citrus Canker.
Dr. E. P. Meinecke, Forest Pathologist, United States Department of Agriculture, San Francisco; Chestnut Bark Disease and White Pine Blister Rust.
Mr. W. D. Pierce of the Bureau of Entomology, United States Department of Agriculture, Washington, D. C.; Cotton-Boll Weevil.
Prof. J. B. S. Norton of the Maryland Agricultural College; Peach Yellows and Peach Rosette.
Prof. H. S. Fawcett; Melanose.
There will also be articles by Mr. Frederick Maskew on fruit flies and by Mr. H. S. Smith on alfalfa weevil.

In view of the extra vigilance that must be exercised, during these trying times, to protect the plant life of California I thought it advisable to devote the entire issue to the description of the principal pests against which we quarantine. This will give our readers a better idea of the life histories and habits of the plant enemies we are endeavoring to keep from invading the orchards and fields of our state, and thus we will be able to prepare ourselves more intelligently for proper defense.

In addition to this quarantine number we expect to distribute a carefully compiled map, showing the districts of the United States placed under quarantine by the California State Commission of Horticulture. I am indebted to our chief quarantine officer for the accurate compilation of the quarantine districts shown on the map, which enables us to locate at a glance the proper lines and demarcations of the infested districts. The map also gives the reason for such quarantine and the number of each quarantine order.

G. H. H.

Cooperative Agricultural Action.—As soon as it became known that a state of war existed between our country and the Central Powers of Europe, this commission concerned itself immediately with the development of a plan of agricultural action by which the county horticultural commissioners might be able to place their extensive practical experience and their long training at the service of their counties by starting a systematic campaign to encourage the production of foods on all available lands suitable for such purpose, in addition to their regular duties of providing accurate crop statistics and controlling plant pests. The outlined plan, no doubt, would have been of considerable economic value, because of immediate results, but the absolute necessity, during this serious, critical period of our national life, of concentrating activities instead of duplicating efforts (a fact recognized by the State Council of Defense) caused us to postpone our operations for the purpose of working with the College of Agriculture of the University of California in a survey of food resources of our state. I will take this opportunity of recognizing the very efficient cooperation given the efforts of the food survey committees by the individual county horticultural commissioners, and of expressing my appreciation of the services which they have rendered.

G. H. H.

Conservation of Farm Products.—In the "Report of Conferences on Agricultural Situation Held at St. Louis, Mo., April 9–10, and Berkeley, California, April 13, 1917," appears this significant statement regarding the farmer's responsibility in the present world crisis: "Upon the farmer rests in large measure the final responsibility of winning the war in which we are now involved. The importance to the nation of an adequate food supply, especially for the present year, can not be overemphasized. The world's food reserve is very low. Not only our own consumers, but much of the world at large, must rely more completely than ever before upon the American farmer. Therefore, the man who tills the soil and supports the soldier in the field, and the family at home, is rendering as noble and patriotic a service as is the man who bears the brunt of battle."

Supplementing the gigantic effort which should be made to increase food crops for man and beast, to the maximum, should be an equally determined effort to conserve the supply of perishable and low-grade products which often go to waste. This applies in a marked degree to fruits and vegetables. Ordinarily, large quantities of low-grade apples, peaches, apricots, plums, pears, oranges, lemons, etc., are wasted. This is particularly true of fruit that has been dropped from the trees by wind storms, and slightly injured fruit discarded in packing. All such fruit that can possibly be utilized this season should be either dried, preserved or canned. The same care should be exercised in the conservation of vegetables. There is an exceedingly large acreage of tomatoes being planted, and under normal conditions we would expect a big wastage of this vegetable. With the prospect of a food shortage in this country, because of the demand that will come to us for food supplies from blood-stained Europe, no effort should be spared to conserve the entire production of this crop. Every housewife can do much toward aiding in this crisis by filling every available fruit jar with either fruit or vegetables, and this season should see the greatest store of home-canned products that has ever been known in the history of the country.

The threatened shortage of cans will make it necessary to utilize all containers that can be made to serve a purpose for canned goods, and will possibly make it necessary to dry much fruit which would otherwise be canned.

With the statement already quoted, viz, "The world's food supply is very low," let us hope that no one will minimize the danger that exists, but with the idea of performing a patriotic service may each individual or family aid, even though in a very small way, toward conserving the supply of fruits and vegetables that are grown, thus adding to the storeroom something that will render the food shortage less serious.

G. P. W.

Horticulture and Legislature.—The legislature has finished its labor, and both the state and county horticultural commissioners have fared well by their activities. A number of important bills and amendments to the present laws have been passed, and I am taking this opportunity to express, in behalf of state and county horticultural officials, our deepest gratification for the practically unanimous support of our legislators. The bills in which we are primarily interested are:

Senate Bill No. 458, relating to the county horticultural commissioner.
Senate Bill No. 460, relating to State Commissioner of Horticulture.
Senate Bill No. 682, relating to collection of parasites for control of mealybug.
Senate Bill No. 751, relating to preventing importation of injurious insects.
Assembly Bill No. 212, relating to standardization of fresh fruit.
Assembly Bill No. 145, the Standard Apple Act.

I am very glad to state that the Governor has signed all these bills.

G. H. H.

Mustard Control.—We are pleased to publish in this issue of the Monthly Bulletin a report of the mustard control demonstration which was conducted this spring by the Yolo County horticultural commissioner, Mr. William Gould, in conjunction with Mr. O. W. Newman of this office.

We hope that the success of this demonstration will arouse an interest among farmers in the control of weeds and that in the future the heavy loss in crops due to their presence may be lessened by the adoption of proper control measures.

While we realize that spraying with iron sulphate is not a new thing, it has been given very little attention in California, due to the fact that prices of hay and grain have not been sufficiently high to warrant the increased expense of control. Furthermore, production has been more extensive than intensive heretofore, and less attention has been paid to increasing the yield per acre than to increasing the acres of yield. Weeds are a "national" menace now. They threaten the food supply of the United States. With the present shortage of food and the necessity for increasing production wherever possible, any measures which may aid in the control of our weed pests are very timely. Another season we hope that many farmers may take advantage of this information.

G. H. H.

The Argentine Ant.—The Argentine ant problem is an interesting example of how an insect may indirectly be responsible for serious damage to agriculture, and well illustrates the complexity of some phases of pest control. The present Bulletin contains a brief article on this ant, bearing especially on its control in citrus groves. There are certain restricted areas in the South where it should be possible to eradicate or practically to eradicate these insects from the groves, if the poisoning experiments carried on by this commission result successfully. With the aid of the county horticultural commissioners and their inspectors, an efficient organization could be had for this work, and the legal authority we already have could if necessary be used to advantage. It should not be difficult, however, to convince anyone who has this ant in his orchard that he is harboring a serious menace to his own welfare as well as to that of his neighbors. Its possibilities are already well illustrated in certain places in California, and the observations of Newell and Barber, as well as those of Lounsbury in South Africa, should serve as a sufficient warning.

G. H. H.

COUNTY COMMISSIONERS DEPARTMENT.

THE MEDITERRANEAN FIG SCALE.

Lepidosaphes ficus.

By FRED P. ROULLARD, County Horticultural Commissioner, Fresno, California.

A striking case of insect pest introduction by the importation of plants from Europe, emphasizing clearly the necessity for the most careful inspection, has been discovered in Fresno County, and investigations and experiments with the view of eradicating it before it becomes too widespread are already under way.

Some eighteen or twenty consignments of fig cuttings were brought to Fresno from Algeria, during 1904 and 1906, through the United States Division of Seed and Plant Introduction. This being prior to the establishment of the system of inspection of imported stock by the Federal Horticultural Board, the stock received was not treated, and as a result a scale pest has been introduced and has spread until it now covers an area with a radius of about three-quarters of a mile. Within this area there are perhaps 75 to 100 trees badly infested, and about 400 trees slightly infested. One rather remarkable feature, which gives encouragement, is the fact that only trees that have had the imported grafts or scions grafted into them show a bad infestation, thus showing that the pest is not easily established and spreads rather slowly.

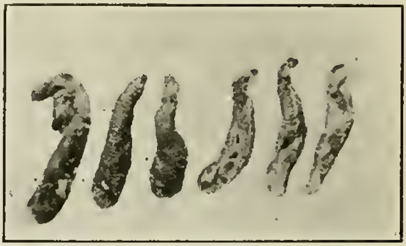

FIG. 61.—The Mediterranean Fig Scale, *Lepidosaphes ficus.* Female scales greatly enlarged. (Original.)

The scale closely resembles oyster shell scale, which attacks such a variety of deciduous trees. Specimens have been sent to the Bureau of Entomology, United States Department of Agriculture, at various times, for examination, and Mr. E. R. Sasscer, who is thoroughly acquainted with both domestic and foreign scale insects, has determined it as *Lepidosaphes ficus*, which is apparently a synonym of *Lepidosaphes conchiformis.* This scale was described in 1903 on leaves of *Ficus* (fig) from Italy, also, earlier, on *Ficus carica* from Algeria, and on figs in England.

The life history of the scale, as observed by the writer for the past two seasons, is as follows:

The female lives beneath the scale during the winter, occupying nearly the whole shell until about the middle of March, when oviposition begins. The young emerge during the month of April. After hatching they crawl about over the tree, establishing themselves upon the trunk, limbs, branches, leaves and fruit, and by the first of June specimens may be found infesting every part of the tree from the ground up.

The scale, when on the fruit and leaves, appears different than when it is on the twigs and trunk, due to variation in different stages of its development. The differences are so marked as to suggest the occurrence of more than one species.

The scale which infests the leaves affords an excellent opportunity for tree inspection. Scales on the leaves (usually underneath, as shown in Fig. 64) will cause a discoloration that can be seen from a distance. A spot, pale greenish white in color, approximately one to two millimeters in diameter, exists where the scale is located and is a sure sign of its presence, thus enabling an inspector to positively detect it. This discoloration occurs both on the fruit and leaves. Close observation is required to find it on the bark, as it is very much the same color as the tree.

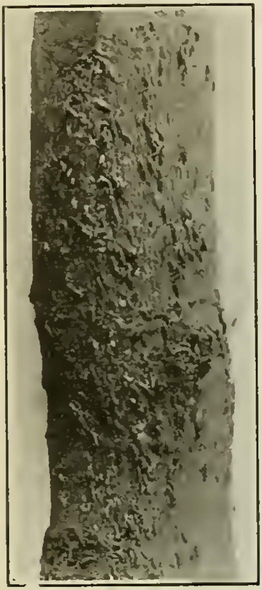

FIG. 62.—The Mediterranean Fig Scale, *Lepidosaphes ficus*, on a branch of imported fig. (Original.)

The best means for control of fig scale have not yet been decided upon. Last spring (1916) several trees were sprayed with a spray material containing a large percentage of naphthol. Considerable damage was caused to both fruit and foliage without affecting the scale to any extent. However, observations made of this scale during the past year and a half have afforded sufficient data on its life history to suggest, as a control measure, a dormant spray used not later than the first week in March. At the time of writing, March 10, the insect is just beginning to lay eggs for this season. Weather conditions and scarcity of spray material have prevented spraying experiments in the orchard before this. Several sprays will be tried, however, and it is hoped that something satisfactory will be found for exterminating the pest, even though the trees may have to be severely pruned to permit thorough spraying.

Two ladybird beetles have been found feeding upon this scale, the two-stabbed ladybird beetle, *Chilocorus bivulnerus*, and Koebele's ladybird beetle, *Lindorus lopanthus*.

The Bureau of Entomology, United States Department of Agriculture, has established a permanent laboratory in Fresno, in answer to a request for a special investigation regarding the life history and control of the fig scale. This request was made through the Horticultural Commission by the fig growers directly interested in the eradication of the pest. R. L. Nougaret, in charge of this station, has already begun the study of this problem.

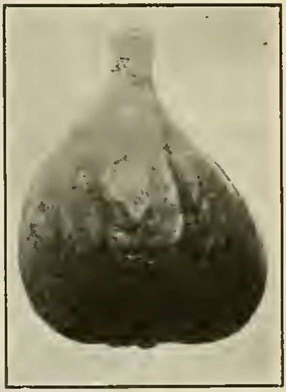

FIG. 63.—Fruit of the fig infested with *Lepidosaphes ficus*. Note the peculiar gray appearance of the stem end. (Original.)

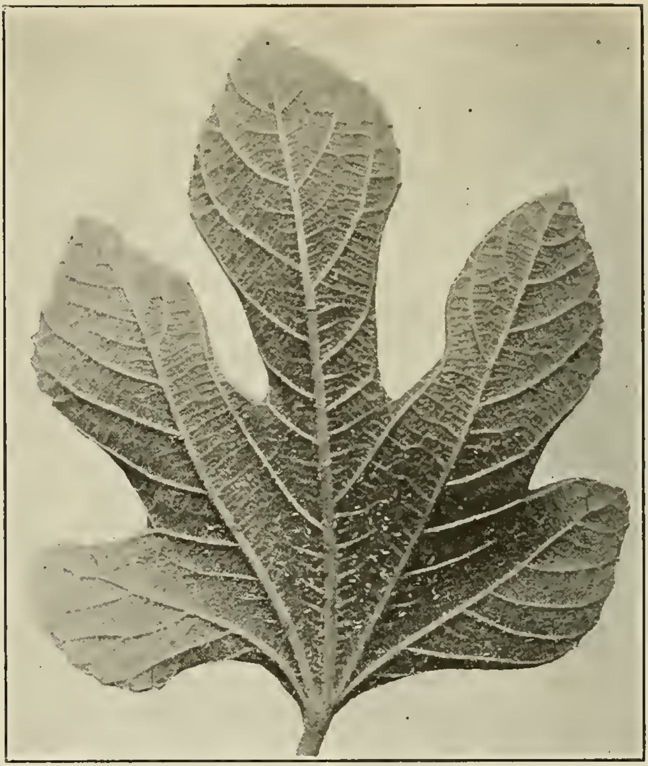

FIG. 64.—A fig leaf infested with the Mediterranean Fig Scale, *Lepidosaphes ficus.* (Original.)

INSECT NOTES.

The attention of the county horticultural commissioners is called to the two following interesting and important insect notes by Doctor Edwin C. Van Dyke and Mr. Harry S. Smith.

EDITOR.

A NEWLY INTRODUCED CLOVER BEETLE.

Sitones hispidulus Germ.

By EDWIN C. VAN DYKE, University of California.

On May 2 of this year I captured some thirty or more recently emerged specimens of this weevil crawling up the side of my house. They had no doubt developed at the expense of the white clover in my near-by lawn and were proceeding to migrate. Inasmuch as this is the first time that this European clover beetle has ever been observed in this state, and since it has already become somewhat widely dispersed and may prove to do some damage, it seems well that it should be made known.

The beetle is about an eighth of an inch in length, of a grizzly color and beset with rather rigid, erect hair. According to Dr. E. A. Schwarz,[1] this common and somewhat destructive clover beetle was first recorded in this country by Dr. J. L. Le Conte in 1876, from Long Island, N. Y., and by 1889 had spread as far as Washington, D. C. I can supplement this note myself, by stating that it has now spread throughout the northeastern states and Canada, has for some years been well established in Western Washington and the Willamette Valley of Oregon and will now, no doubt, soon be equally at home here.

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[1] Proc. Ent. Soc., Wash. Vol. 1 (1890), pp. 248-249.

A SCALE INSECT NEW TO CALIFORNIA.

By Harry S. Smith, Superintendent State Insectary.

Mr. D. D. Sharp, county horticultural commissioner of Riverside County, recently called my attention to a Palmetto on the Wright ranch near Riverside, which is heavily infested with the Palmetto scale, *Comstockiella sabilis* (Comst.). This scale seems to have been recorded from Florida and the Guadaloupe Islands only. Mr. Wright states that it has been present on this tree for something like 15 years, and while he has growing in his yard over 40 different varieties of palms, it has never been found on anything but the Palmetto. In view of this, there seems to be little danger that this scale will attack either the date palm or ornamental palms, but Mr. Sharp states that in order to be safe he will attempt to eradicate the scale on the infested Palmetto.

DESTROY THE GRASSHOPPERS.

By Theodore D. Urbahns, Entomological Assistant, U. S. Department of Agriculture.

The several species of closely-related insects, commonly known as grasshoppers, have in recent years caused such great destruction to the nation's food supply that the present necessity for increased food production and protection against the ravages of this pest, makes it important for every farmer to acquaint himself with the most modern and effective methods of destroying grasshoppers. He should, immediately upon their appearance, even in small numbers, put such practices into effect as will avoid further great loss in the nation's food supply.

In California alone grasshoppers have caused an annual destruction of at least $1,000,000 to the cereal and forage crops, which are the main crops necessary for the food supply; not mentioning the immense loss from this pest to the fruit, vegetable and truck crops of this section of the country. In some of the larger alfalfa fields the annual loss constitutes almost one-third of the normal production. In other sections this pest is present year after year, causing a great aggregate loss, but hardly abundant enough to arouse the individual farmer to an effective grasshopper campaign. It is this aggregate loss over hundreds and thousands of farms that must be lessened, as well as the loss where the pest appears in such great numbers as to detroy the entire crop.

Editor's Note.—This article was written for immediate use and is published with the kind permission of Dr. L. O. Howard, chief of the Bureau of Entomology, U. S. Department of Agriculture. Mr. Urbahns has had a wide experience in the control of grasshoppers, and with the present necessity for maximum production of food crops the advice concerning grasshopper control is both timely and valuable.

OUR MOST DESTRUCTIVE SPECIES.

Melanoplus devastator.—This is a common, small species, and one of the most destructive in the state. The general color is amber or brownish. It is found principally in the San Joaquin and Sacramento valleys. Frequent migrations from the hills to the valleys below take place. While in the hills the hoppers feed on the pasture grasses, but when in the valleys will attack any of the cultivated crops.

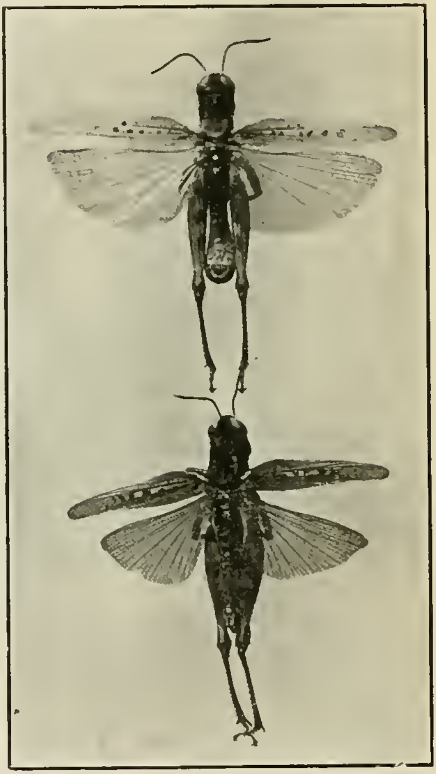

FIG. 65.—The devastating grasshopper, *Melanoplus devastator.* Slightly enlarged. (After Essig, Inj. and Ben. Insects of Cal.)

Melanoplus differentialis is a large, yellowish-colored grasshopper about 1½ inches in length, and is one of the most destructive species in the alfalfa fields. It has been present in great numbers throughout the central valleys of California.

Melanoplus atlanis is yellowish gray in color and about 1 inch in length. It is more active in flight than *M. differentialis* and is very destructive to alfalfa, corn and grasses in general throughout the southern counties of the state.

Melanoplus bilituratus is a species in appearance very much like *M. atlanis*, and is also very destructive in the southern counties, especially in the Imperial Valley.

Camnula pellucida. The adults

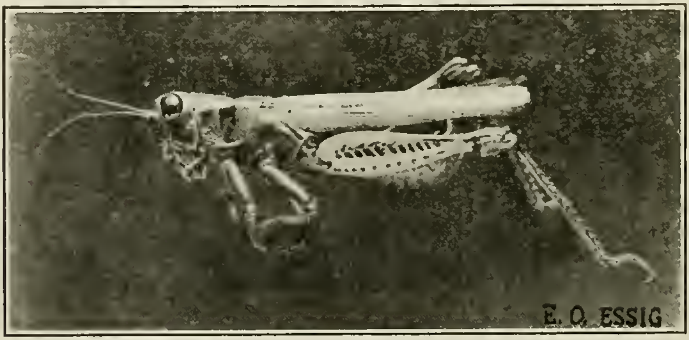

FIG. 66.—The differential grasshopper. *Melanoplus differentialis.* Natural size. (After Essig, Inj. and Ben. Insects of Cal.)

of this species are about 1 inch in length and vary in color from a light yellow to ashy brown. They have been very destructive in recent years on farms bordering uncultivated lands and the rolling foothills.

Schistocerca venusta is a large, greenish-colored grasshopper, which has been observed to be very destructive to alfalfa and maize.

Besides those mentioned, there are a multitude of other species responsible for great annual destruction to our crops.

BREEDING GROUNDS.

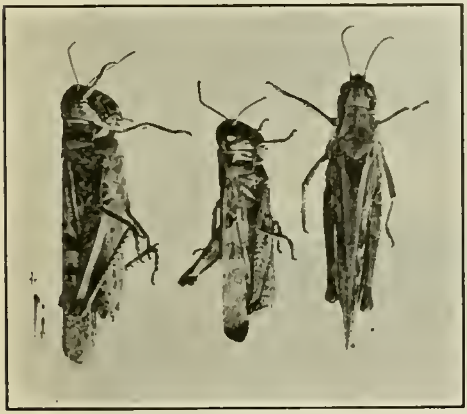

FIG. 67.—The pellucid grasshopper, *Camnula pellucida*. Natural size. (After Essig, Inj. and Ben. Insects of California.)

It is of the greatest importance that farmers acquaint themselves with the breeding grounds of the different grasshoppers. Some of the species, like *Melanoplus differentialis*, apparently find the crowns of alfalfa plants most favorable places for depositing their eggs, and select especially those plants growing along ditch banks, check ridges, or any higher portions of a field. Other species favor the roadsides, ditch banks and uncultivated areas where weeds and grasses have been allowed to grow unmolested for a period of years. Then again, *Camnula pellucida*, one of our smaller but most destructive species, deposits its eggs in great abundance on the grass-covered foothills. The breeding grounds of these grasshoppers may readily be discovered by watching where the adults collect in late summer months and by the appearance in great abundance of the small hoppers in early spring.

DESTROYING GRASSHOPPERS IN THE FOOTHILLS.

Those species of grasshoppers selecting the grass-covered slopes of the foothills, their most favored breeding grounds, hatch in the early spring, feed upon the green, tender grasses for a time and then, with the drying of the grasses, work their way down the hillsides into the gulches, and swarm down in great hordes over the cultivated fields of the irrigated valleys below. Communities suffering annual loss from such species can not afford to wait until these pests have fed and developed upon the grazing lands and then spread out over the fields, before taking measures for their destruction.

These grasshoppers can be most effectively poisoned while they are still young and in great swarms on their native breeding grounds and working their way down the gulches. They should under no consideration be allowed to come all the way down and spread over the cultivated fields.

DESTROYING GRASSHOPPERS IN THE FIELDS.

Any careful observer will soon learn that the grasshoppers breeding throughout the cultivated farming areas first appear in great numbers along the uncultivated ditch banks, roadsides, fence lines and check ridges. It is here, then, that the farmer should at once begin to distribute poison and prevent these small hoppers from working their way out over the entire field. At times, however, hundreds of acres of alfalfa fields become so severely infested with grasshoppers that there are from one hundred to five hundred of the pests to the square yard. In such instances there is often a complete destruction of the crops in the areas over which the grasshoppers have fed. In the first place, a farmer should never allow such a condition to develop, but if it does exist, immediate treatment of the entire field is necessary. If, however, the infestation is hardly severe enough to warrant spreading poisons over the entire field, the alfalfa of alternating lands may be cut, thereby crowding the grasshoppers onto the uncut portions or strips, where they may be effectively poisoned by a small expenditure of money and labor.

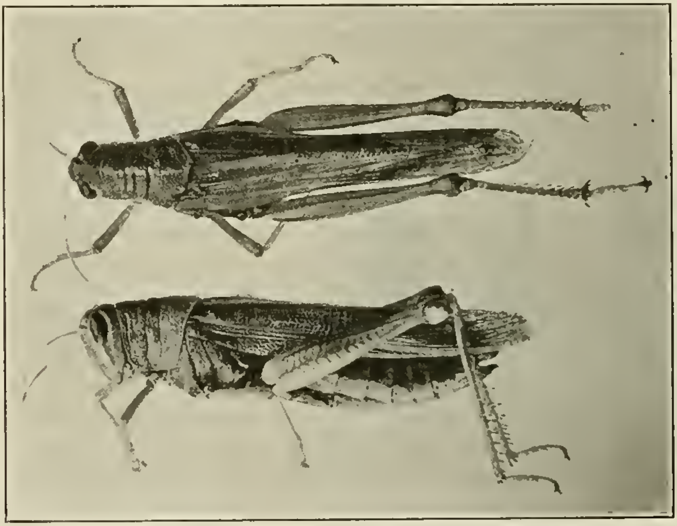

FIG. 68.—The vagrant grasshopper, *Schistocerca venusta*. Slightly enlarged. (After Essig, Inj. and Ben. Insects of Cal.)

MIXING THE POISON.

The following formula has been found very effective in destroying grasshoppers:

Paris green	1	lb.
Molasses (cheap black strap)	2	qts.
Lemons	½	doz.
Water	4	gals.
Bran	25	lbs.

Mix the above materials as follows: Stir thoroughly the Paris green, molasses and water first. Grind the lemons in a meat grinder and add to this liquid. Then slowly pour the mixed solution over the bran and stir thoroughly until an even mixture is secured.

SUBSTITUTES.

If the Paris green can not be secured, half the amount of white arsenic may be used instead, and reasonably good results expected. Oranges may be used to replace the lemons if the latter can not conveniently be secured. If bran is found too expensive, good results may be expected by substituting either alfalfa meal or rice meal.

METHOD OF SPREADING POISON.

Where the poison is to be spread on rocky hillsides, ditch banks, and fence lines, it is most convenient to have the poison bran mixture in a bucket and spread it by hand, as in the manner of broadcasting grain. If fifty or one hundred, or even one thousand acres are to be covered with this poison, it has been found most practical to spread it with an end-gate grain-seeder attached to the rear of a farm wagon and geared from one of the rear wheels. The poison bran bait should be spread so that it falls on the ground as fine as possible, avoiding any lumps, which are a waste of material. The above proportion should be sufficient to cover an area of about five acres.

WHEN TO SPREAD POISON.

Grasshoppers are naturally most hungry and thirsty after they have been driven to the shade by the intense heat of a summer day, and may be noticed to begin feeding ravenously late in the afternoon. For this reason it is desirable that the poison should be spread in the afternoon, and still early enough so that it is on the ground before the hoppers have secured their evening feed. It is better to spread the poison over fields a few days before irrigation, than just following irrigation.

RESULTS TO BE EXPECTED.

Two or three days after the poison bait has been properly spread over the field the grasshoppers should begin to collect in the crowns of plants and other shaded places and die in great numbers. The dead grasshoppers are frequently destroyed by beetles, ants, grasshoppers and other insects, some of which are active only during the night.

DANGER OF POISONING LIVE STOCK.

If the poison has been properly spread over fields there should be absolutely no danger of poisoning live stock. This poison bait has been used in great quantities by the writer, on alfalfa fields which were being pastured by young and old live stock, with no indication of injury to any of the animals; and even around farmyards, with very little loss to poultry. It must, however, be remembered that this poison should not be mixed near the house or barnyard where poultry and live stock are present and may chance to eat quantities of the poisoned bait.

THE ARGENTINE ANT AS AN ORCHARD PEST.

By Harry S. Smith.

"The Argentine ant (*Iridomyrmex humilis* Mayr) * * * is the first among the Formicidæ to attain the front rank among injurious insects of the United States. In its field, the Argentine ant is not excelled in destructiveness by even the gipsy moth, the boll weevil or the San Jose scale. Though this ant is limited as yet to comparatively small areas, the observations and experiments of the authors fully convinced them that future years will see this insect steadily invading new territory and forcing its depredations upon the inhabitants of all southern California and most of the Gulf states."

At the time the above paragraph was written (1912) by Newell and Barber, of the United States Department of Agriculture, the Argentine ant was considered primarily a municipal pest, although even at that time its potentiality as an indirect pest of orchards was realized by the authors. It is only recently, however, that the growers themselves have come to appreciate the possibilities of this insect for damage to the fruit industry, mainly through its influence on infestations of mealybugs, black and soft brown scales.

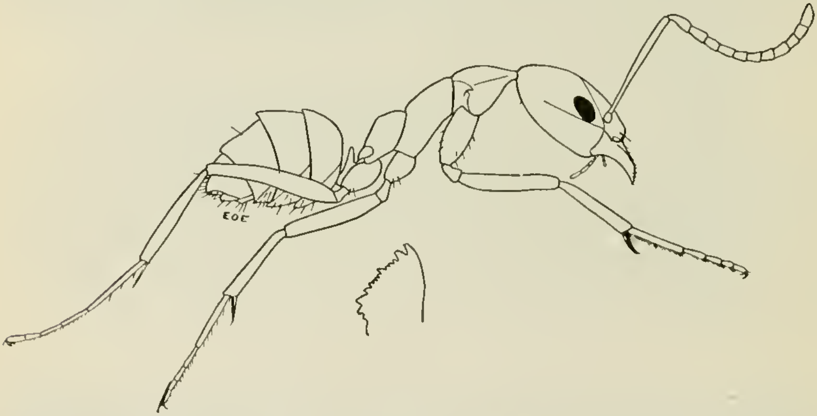

Fig. 69.—Worker of the Argentine ant, *Iridomyrmex humilis*, and detail of a mandible, showing the arrangement of the teeth. Greatly enlarged. (After Essig, Inj. and Ben. Insects of Cal.)

The Argentine ant is, as its name indicates, a native of Argentina and is also common in Brazil. It was supposedly introduced on coffee ships into New Orleans, and was first noticed there in 1891. It also occurs in South Africa and Chile. In the United States at the present time it is found in a number of the Gulf states, as well as in California. Professor Woodworth gives its occurrence in this state as follows: Alameda, Azusa, Berkeley, Byron Hot Springs, Campbell, Claremont, College Park, Corona, Cupertino, Emeryville, Fruitvale, Los Angeles, Martinez, Melrose, Monrovia, Montecito, Oakland, Piedmont, Riverside, San Francisco, San Jose, Santa Clara, San Mateo, Stege, Stockton and Upland. During the past season we found it in several places in Sacramento.

The ant itself is a small, dark brown insect, and is practically without odor when crushed. There are three forms: the worker, the queen and the male. The queen is about twice as large as the worker and somewhat differently shaped, the abdomen being comparatively larger. The male is slightly larger than the worker and has a much larger thorax and smaller abdomen in comparison. Both of the true sexes are winged, although the wings of the queen are shed after a short time.

The ant nests in large colonies, either in the ground or in the crotches of trees, or in practically any protected place. A nest will contain from one to a large number of queens, the duty of which is to lay the eggs from which the colony develops. These are deposited at the rate of as high as fifty per queen per day, and are immediately removed by the workers and placed in localities in the nest where conditions are most satisfactory for their development. As soon as the eggs hatch the larvae are cared for by the workers and fed with sweet substances, which they collect by foraging. This food consists mostly of the honey-dew secreted by aphids and scale insects.

The dissemination of the ant is brought about in two ways: first, by artificial means, such as transportation with nurserystock and plants, and, second, by the natural wandering of the insects themselves. While the former method suffices to carry the pest long distances, they do not of their own accord spread with any great rapidity, since the queens do not seem to use their wings for flying to any extent, and the distance which they can cover by crawling is not more than a few hundred feet per year. This has a very important bearing upon the control of the pest.

The Argentine ant has no equal as a household pest. It will feed on practically all kinds of cooked food, as well as raw meats, sugar, fruits, etc. In some localities in the southern states it has become such an intolerable pest that the tenants have vacated houses and caused realty values to drop. It is in the orchards, however, that it promises to do the most serious damage in California. This damage is brought about by the protection which it gives to mealybugs and other scale insects from their natural enemies. It has been found that these pests of fruit trees increase enormously in those localities where the ant is abundant. Newell and Barber write as follows:

"It is in the orange groves of southern Louisiana, however, that this ant has probably inflicted the most serious injury. * * * Suffice it to say that at present the Argentine ant is there regarded as the most serious insect problem, owing to the marked increase of scale insects which follows its introduction and spread. The value of land in that section depends to a considerable extent upon the presence or absence of the Argentine ant. The ant also does considerable damage to the fig crop, by boring through the ripened fruit, or entering the calyx end of the ripening fig and tunneling the interior. It also assists in the increase of the destructive mealybug, *Pseudococcus citri,* which injures figs to a considerable extent.

"In the sugar-cane fields the ant again comes to the front, owing to its fondness for the excretions of the sugar-cane mealybug, *Pseudococcus calceolariae.* In order to protect these insects from storms and enemies the ants build protective coverings and shelters over them and attend them constantly. As the result of these attentions, the mealybugs thrive in numbers and destructiveness to an extent which is impossible wherever the ants are not present."

Mr. Woglum of the United States Department of Agriculture has shown, by experiments carried on for two years on a rather large scale, that if the ants are kept from the citrus trees the citrus mealybug is kept in complete subjection by its natural enemies. This will probably be found to be more or less the case, also, with such insects as the black scale and the soft brown scale. It will be seen that the presence of the Argentine ant is of vital consequence in the work of introduction of natural enemies of our citrus pests, and it is for this reason that the state insectary has been paying particular attention during the past season to the Argentine ant problem. The ant constitutes a menace not only in the localities where the mealybugs occur at the present time, but in all of the orchards where it is found, on account of the fact that the mealybugs may at any time be accidentally introduced into the ant-infested regions. It is of the greatest importance from the orchardist's standpoint, therefore, to control, or, if possible, eradicate this insect, not only in the mealybug-infested sections, but wherever it occurs.

Many different methods of control have been tried out against this ant, the most promising of which may be grouped in two classes, viz. barriers which the ants cannot cross, and poisoning. Since in this article we are considering only its relation to the orchards, we will omit any reference to control as a pest in cities.

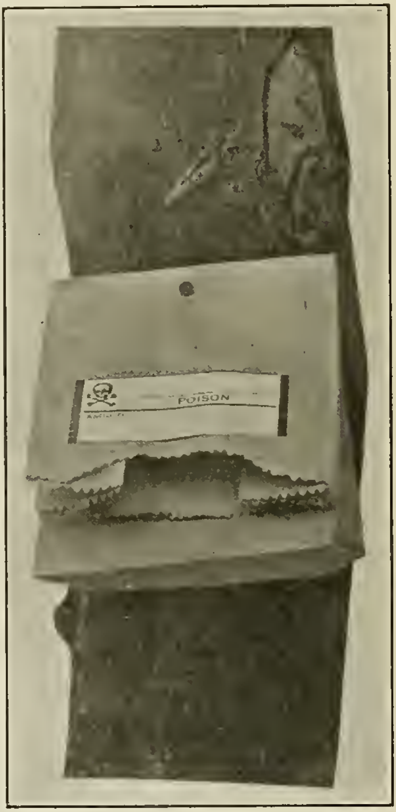

FIG. 70.—Showing poison bag in place on tree trunk. The top of bag is folded over to protect the entrance holes from rain or spray. (Original.)

Barriers are of two kinds: those which depend upon their physical properties, *i.e.*, stickiness or viscosity, and which the ants are physically unable to cross; and the repellent kinds, which depend upon a disagreeable odor or poisonous fumes to keep the insect from crossing. Of the former type two kinds are in use, the most important one being a preparation of commercial tree tanglefoot to which finely powdered sulphur has been added, in the proportion of one part of sulphur to six parts of tanglefoot. This is placed in a band about five inches wide around the trunk of the tree, and is very effective when properly mixed and applied, providing it is kept in good condition. This formula was devised by J. R. Horton of the United States Department of Agriculture, and was published in Vol. 5. No. 11, of the Monthly Bulletin, to which those interested are referred. The second type of barrier is exemplified by the corrosive sublimate band, which is also described in Mr. Horton's article above referred to. While it is quite effective, its cost is probably prohibitive for orchard work, and there is also an element of danger in its use which must not be overlooked.

In my opinion, however, judging from experiments carried on at the southern branch of the insectary at Alhambra, and which it must be admitted are yet too young to justify final conclusions, the poisoning method will supersede entirely the barrier method for the control of this pest in the orchard. Poisoning was successfully used by both Professor Woodworth and Mr. E. R. Barber, of the United States Department of Agriculture, in municipal work, and in our experiments we have made use of the formula which was proven most satisfactory by Mr. Barber. The secret of this method lies in the use of a poison which is so dilute that the worker ants will carry it to the nest in large quantities and feed it to the egg-laying queens and larvæ, which succumb to its effects in two or three weeks. A strong poison will destroy the workers before they are able to carry it to the nest, with the result that the colony continues to thrive at the expense of the orchard.

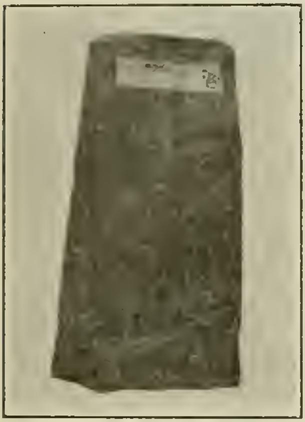

FIG. 71.—Poison bag before folding showing position of entrance holes and poison label. (Original.)

The Bureau of Entomology formula is as follows:

"Prepare a sirup:		
Granulated sugar	15	pounds
Water	7	pints
Tartaric acid (crystallized)	¼	ounce
Boil for 30 minutes. Allow to cool.		
Dissolve sodium arsenite (C.P.)	¾	ounce
In hot water	1	pint
Cool. Add poison solution to sirup and stir well. Add to the poisoned sirup:		
Honey	1½	pounds
Mix thoroughly.		

"From the results so far obtained, the careful preparation of the poisoned sirup can not be too highly emphasized. Very accurate balances are necessary for the weighing out of the poison and the tartaric acid. This is especially true when small quantities of the sirup are prepared."

As a container for the poisoned sirup for use in orchards we have found the paraffine paper bag to be best. One pound or one-half pound paper bags with flat bottoms should be secured and holes should be made as in the illustration. These can best be made with a common leather punch, several bags being punched at one time. Then they should be dipped, closed, in hot paraffine and opened before cooling. A small piece of clean sponge may be placed in each bag, although this is not essential. About two ounces of the sirup should be placed in each bag, which should then be tacked to the trunk of the tree, after folding, as shown in the illustration. Several experimental plots of one acre each in citrus orchards have been provided with poison bags. In the plots where the poison has been out for a month the ants are difficult to find on the trees, while in the check plots in the same orchards they are present in enormous numbers.

At the present time the poison method looks much more promising than banding. The latter method is expensive and when not done by experienced men is ineffective. The effects of dust and hot sun, together with the growing of cover crops in the orchard, make satisfactory banding a difficult and expensive proposition. The poison method has none of these difficulties to contend with and its results should be more or less permanent.

If, after the present experiments are carried through the entire season, it is demonstrated that we can effectively combat the ant by this means, a general campaign should be carried on against the pest, with the cooperation of the county horticultural commissioners. There is still time to attempt the subjugation of the Argentine ant, at least in restricted orchard districts, if it can be done by means of poison bags, and such an attempt would certainly be justified in view of the possibility of the insect as an indirect orchard pest.

DARK CURRANT FRUIT FLY IN CALIFORNIA.

Rhagoltis ribicola, Doane.

By Henry H. P. Severin, California Agricultural Experiment Station.

In the summer of 1915, Mr. E. P. Van Duzee, together with the entomological field class of the University of California summer school, spent about five weeks in the Sierra Nevada Mountains and added over six thousand mounted insects to the university museum. Among the flies collected was a single specimen of the dark currant fly (*Rhagoletis ribicola*, Doane), which is of considerable economic importance in the state of Washington. In order that there might be no question of doubt as to our identification of this pest, this trypetid was sent to Professor R. W. Doane (2) who described the species. Professor Doane states, "I have a single specimen of *Rhagoletis ribicola* from Pullman, Washington, and your specimen seems to agree with it in every respect." The dark currant fly was captured near Cathedral Lake, in a valley on the eastern slope of Mount Tallac, at an altitude of about 7,500 feet, Tahoe, California, on July 6, 1915.

Description.

The dark currant fly is about half as large as the house fly. The body is black, with four broad longitudinal white stripes on the thorax, and a large yellow spot on the scutellum. The head is pale yellow, with greenish eyes. A white stripe is present on the second, third and fourth abdominal segments. The legs are pale yellow in color. The wings are crossed with four brown bands, as shown in the accompanying figure.

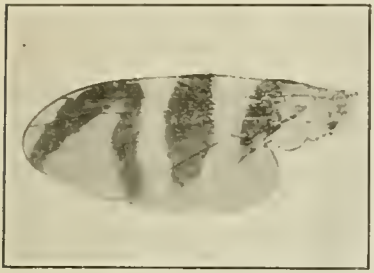

FIG. 73.—Wing of the dark currant fly. (*Rhagoletis ribicola*, Doane) showing four crossbands. (Original.)

The following notes on the life history, nature of injury and control are taken from Piper and Doane's (3) work on this pest in the state of Washington.

Life History.

These flies may be found around currant and gooseberry bushes from about June 15 to July 15. The female usually deposits a single egg, sometimes two, beneath the peel of the berry. The egg period was not determined. As soon as the maggot hatches it eats its way toward the center of the berry and feeds there, becoming full-grown in three or four weeks. When mature, the larva bores out of the fruit, enters the soil a short distance, or conceals itself beneath leaves or rubbish, and pupates. The rest of the summer and winter is passed in a brown or black puparium. The fruit flies emerge during the following spring.

Nature of Injury.

A word or two in regard to the nature and extent of injury may be of interest. A few days after the egg is deposited a brown spot begins to appear and increases in size until it is about the size of a pinhead. The berry ripens prematurely. A large per cent of the infested berries drop to the ground before the larvæ are mature; some of the fruit, however, remains on the bushes, the full-grown maggots make their way through the peel and drop to the ground. The amount of injury varies from year to year, being much worse some seasons than others. A few wormy berries in a crate, however, is enough to make the whole lot unusable, for it is quite impracticable to separate the infested berries from the sound ones.

Distribution.

Rhagoletis ribicola has been recorded from the state of Washington and northern Idaho. Aldrich (1) states that "it is a native species, as I collected an adult on a wild gooseberry at Pollock, Idaho, many miles from a railroad; its original food was doubtless the wild species of currant and gooseberry, so abundant in the Pacific Northwest." The fact that our specimen was collected at an altitude of 7,500 feet indicates that this pest has not been introduced into California, but that its native home also includes this state.

Food Plants.

The present known food plants include the fruit of cultivated currant and gooseberry bushes, but, in all probability, the wild currants and gooseberries are also attacked by the pest.

Control.

Four methods of control are suggested: (1) gather and destroy the fallen infested fruit frequently; (2) remove the soil to a depth of about an inch below the bushes and bury it deep or deposit it on a road or other exposed place where the pupæ will be killed; (3) allow chickens under the bushes, for they will devour many of the larvæ and pupæ; and (4) pick the whole crop of berries and destroy them before they begin to ripen and before any begin to drop. By sacrificing one crop all of the larvæ would be killed and the patch freed from the pest until the flies come in again from other currant and gooseberry gardens.

The writer has had no experience in the control of the dark currant fly, but most of the above remedial measures were tested with another species of currant or gooseberry fruit fly (*Epochra canadensis* Loew). The methods discussed, as well as other control measures, will be reviewed in a future paper.

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2. Doane, R. W. 1898. Ent. News, IX, pp. 69–72.
3. Piper, C. V. and Doane, R. W. 1898. Wash. Agr. Exp. Sta. Bul. 36, pp. 3–9.
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QUARANTINE DIVISION.

REPORT FOR THE MONTH OF MARCH, 1917.

By Frederick Maskew.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	73
Passengers arriving from fruit-fly ports	4,800

Horticultural imports:

	Parcels
Passed as free from pests	199,486
Fumigated	2,428
Refused admittance	197
Contrabrand destroyed	57
Total parcels horticultural imports for the month	202,168

Pests Intercepted.

From British Columbia:

Rhizoctonia and *Fusarium* sp. on potatoes.

From China:

Cylas formicarius in sweet potatoes.
Lepidopterous larvæ in dry roots.
Cladosporium citri on oranges.
Aphis sp. on green vegetables.

From Florida:

Phomopsis citri and *Lepidosaphes beckii* on grapefruit.

From Hawaii:

Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Coccus longulus on betel leaves.
Chrysomphalus aonidum on green cocoanuts.
Trypetid larvæ in mangoes.
Trypetid larvæ in cucumbers.

From Japan:

Coccid and root knot on persimmon trees.
Fungus on oranges.
Pseudaonidia duplex and *Parlatoria* sp. on camellias.
Lepidopterous larvæ and *Fiorinia* sp. on Cephalotaxus.
Poliaspis pini on pine trees.

From Mexico:

Chloridea obsoleta in tomatoes.
Anthonomus grandis var. *thurberiæ* in cotton bolls.
Chrysomphalus aurantii, *Chrysomphalus dictyospermi*, *Lepidosaphes gloverii* and *Parlatoria pergandii* on limes.

From New South Wales:

Fiorinia fiorinia on kentia palms.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	26

Horticultural imports:

	Parcels
Passed as free from pests	92,335
Fumigated	178
Refused admittance	5
Contrabrand destroyed	9
Total parcels horticultural imports for the month	92,527

Pests Intercepted.

From British Columbia:

Aleyrodes sp. on holly.

From Florida:

Lepidosaphes beckii and *Phomopsis citri* on grapefruit.

From Japan:

Cicada eggs and *Thyridopteryx ephemeraeformis* on persimmons.
Cicada eggs and *Pseudococcus* sp. on azaleas.
Pseudaonidia duplex on camellia.

From Louisiana:

Chrysomphalus aonidum, *Ceroplastes* sp., and *Coccus hesperidum* on unidentified shrubs.

From Mexico:

Chloridea obsoleta in tomatoes.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	23
Fish boats inspected	25
Passengers arriving from fruit-fly ports	99

Horticultural imports:	Parcels
Passed as free from pests	3,348
Fumigated	2
Refused admittance	5
Contrabrand destroyed	1
Total parcels horticultural imports for the month	3,356

Pests Intercepted.

From Iowa:

Crown gall on deciduous stock.

From Mexico:

Lepidosaphes beckii and *Chrysomphalus aurantii* on lemon.

From Missouri:

Crown gall on pear stock.

From Nebraska:

Crown gall on apple stock.

From Ohio:

Coccus hesperidum on crotons, root knot on deciduous stock.

From Texas:

Crown gall on deciduous stock.

EUREKA STATION.

Steamship and baggage inspection:

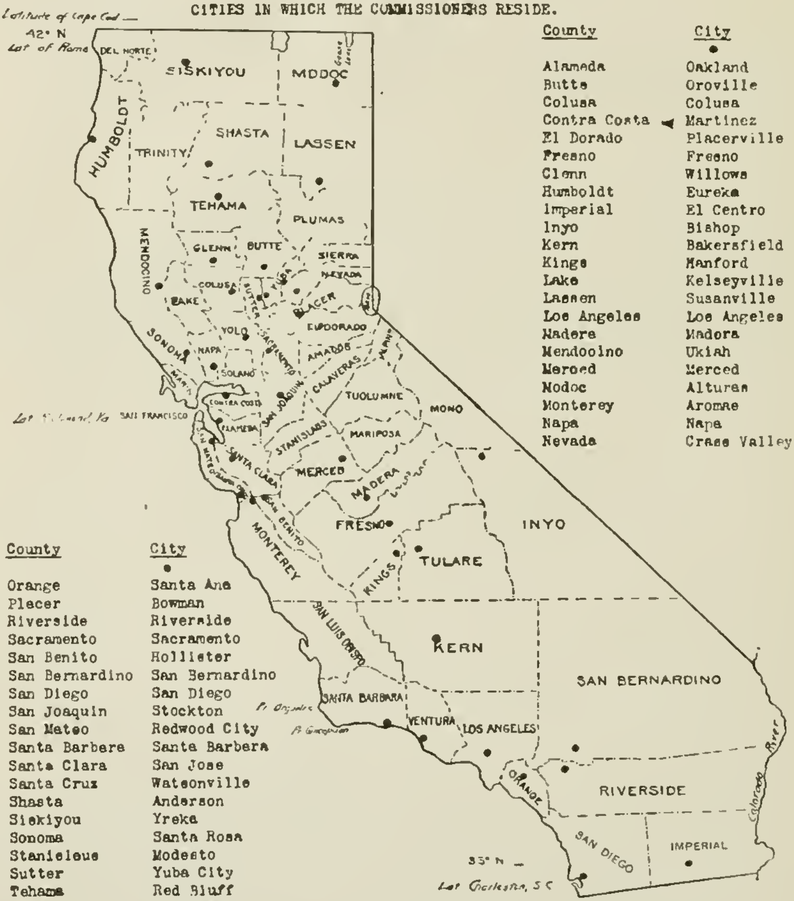
Ships inspected	6

Horticultural imports:	Parcels
Passed as free from pests	54

SANTA BARBARA STATION.

(No report.)

COUNTIES HAVING HORTICULTURAL COMMISSIONERS, WITH THE RESPECTIVE CITIES IN WHICH THE COMMISSIONERS RESIDE.


Latitude of Cape Cod
42° N
Lat of Rome
DEL NORTE
SISKIYOU
MODOC
Goose Lake
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
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ALPINE
MARIN
CONTRA COSTA
Lat Richmond Va
SAN FRANCISCO
ALAMEDA
SAN JOAQUIN
CALAVERAS
TUOLUMNE
MONO
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
SANTA CRUZ
MERCED
MADERA
SAN BENITO
FRESNO
INYO
MONTEREY
TULARE
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
Pt Arguello
Pt Concepcion
VENTURA
LOS ANGELES
ORANGE
RIVERSIDE
Colorado River
SAN DIEGO
IMPERIAL
35° N
Lat Charleston, S.C.

County	City ●
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Butte	Oroville
Colusa	Colusa
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El Dorado	Placerville
Fresno	Fresno
Glenn	Willows
Humboldt	Eureka
Imperial	El Centro
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Kern	Bakersfield
Kings	Hanford
Lake	Kelseyville
Lassen	Susanville
Los Angeles	Los Angeles
Madera	Madera
Mendocino	Ukiah
Merced	Merced
Modoc	Alturas
Monterey	Aromas
Napa	Napa
Nevada	Grass Valley

County	City ●
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Placer	Bowman
Riverside	Riverside
Sacramento	Sacramento
San Benito	Hollister
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San Diego	San Diego
San Joaquin	Stockton
San Mateo	Redwood City
Santa Barbara	Santa Barbara
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RIVERSIDE CONVENTION POSTPONED

THE spring convention of the State Fruit Growers' Association has been postponed and will not be held at Riverside this year as originally planned. Because of the additional duties imposed on each individual concerned in horticultural pursuits on account of the war it was deemed advisable to cancel the semiannual convention this year. The people of Riverside, after consultation, displayed a magnanimous spirit in agreeing that we were not justified in holding the convention this year. The regular annual convention of 1918 will be held at Riverside.

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SACRAMENTO
1917

VOLUME VI No. 7

MONTHLY BULLETIN

State Capitol, Sacramento, California

OF THE

STATE COMMISSION OF HORTICULTURE

SACRAMENTO, CALIFORNIA JULY, 1917

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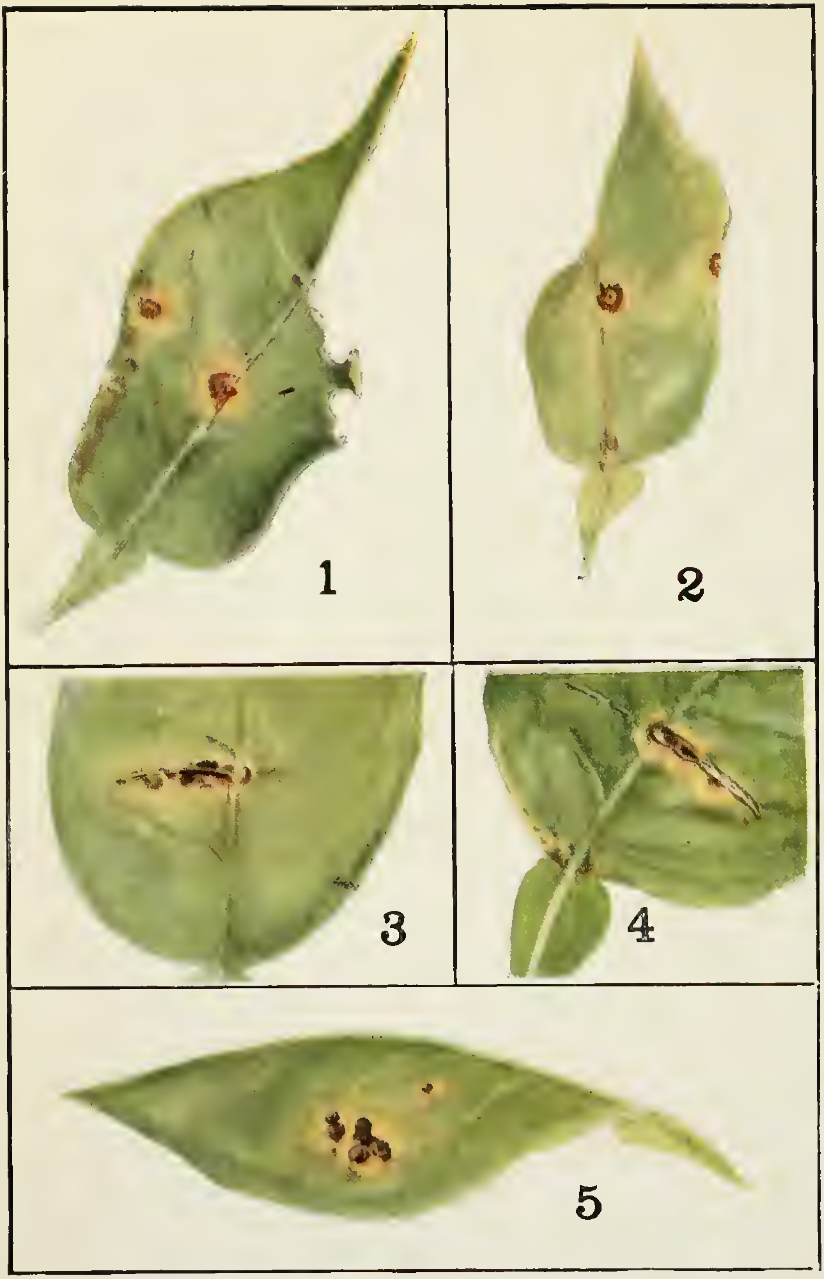

CITRUS CANKER ON GRAPEFRUIT LEAVES.

1. Canker on upper surface of grapefruit leaf. 2. Lower side of the same leaf. 3. Canker on lower surface of grapefruit leaf along scratch made by a thorn. 4. Upper surface of same leaf. 5. Young canker on lower surface of grapefruit leaf. All natural size. Collected in South Dade County, Florida. (Courtesy of Florida Plant Board.)

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CITRUS CANKER.

By WILMON NEWELL, Plant Commissioner, Gainesville, Fla.

Few plant diseases have attracted, during the first few years following their introduction into the United States, as much attention as has citrus canker. Certainly no disease has been the subject of such energetic investigation by plant pathologists or the cause for such intensive and drastic means for its control. In fact, "control," in this instance, became almost immediately a question of eradication and the present warfare on citrus canker in the United States is unique in that it is the first instance in the history of applied plant pathology where a systematic attempt has been made to completely remove from a country the very last vestiges of a plant disease.

Sufficient progress has been made in the eradication campaign, in Florida at least, to justify the conclusion that eradication is but a question of continuing adequate measures upon a sufficiently extensive scale for from two to four years longer. The final elimination of every center of infection from the United States, or even from an individual state, will establish an entirely new practice in the control of injurious insects and plant diseases—one infinitely more practical and economical in the end than a continued warfare for all time to come by means of insecticides and fungicides.

The first case of citrus canker found in Florida was discovered on September 30, 1912, by the State Nursery Inspector, on *Citrus trifoliata* seedlings which had been imported from Japan. It was not recognized as a new disease at that time and was diagnosed by several plant pathologists as being an "unusual manifestation" of citrus scab. Specimens taken at this time were found, months later, to be identical with the disease which later on came to be known as "citrus canker."

The disease doubtless occurred in Texas, and perhaps Alabama, as early as 1912. In fact, information gathered by the writer indicates that one nursery in Texas was infected with the disease as early as 1911, but such information could not be verified as specimens of the "trouble" were not preserved.

In July, 1913, the disease appeared in a nursery in a southern Florida county and because of its rapid rate of spread and injury to the stock was regarded with grave suspicion by the Nursery Inspector and all measures at his command were taken to prevent its spread. Adequate laws for dealing with an unknown and unnamed disease were not then in effect in Florida and this experience with citrus canker showed the justification of quarantine laws sufficiently broad in their scope to permit the quarantining of any suspicious insect or disease.

In the spring of 1914 the disease appeared in citrus trees which had been secured from the southern Florida nursery just mentioned, and the grove owners became much alarmed. In May, 1914, the Florida Growers' and Shippers' League contributed funds for a preliminary investigation and one grove inspector was employed in the county referred to. By June the growers of this county realized that a disease possessing a virulence previously unheard of was making havoc in their groves. Attempts to control the trouble by means of sprays and by cutting out infected leaves, twigs and branches, and treating the remaining portions of the trees with disinfectants proved ineffective. In July, 1914, the growers in this county abandoned all hope of curing the disease and adopted a campaign of eradication consisting of the destruction of the infected trees by fire, a burning oil spray being used for the purpose.

At the same time, in a county several hundred miles away, the same disease, though its identity was unknown, was destroying the grapefruit plantings. Here a little band of determined growers, without the knowledge of plant pathologists or state officials, was attempting every control measure that ingenuity could devise and, finding all measures without effect, they also came to the conclusion that their only hope lay in burning the infected trees. They accordingly employed one of their number to seek out the infected trees and as rapidly as these were located they were burned by piling "light wood" about them and supplying the torch.

The Bureau of Plant Industry, U. S. Department of Agriculture, was constantly in touch with the situation in Florida and the Gulf States during 1914, and as a result of information furnished by the Honorable Secretary of Agriculture to Congress, the latter body appropriated $35,000 for investigating the possibility of eradicating the disease, this fund becoming available February 1, 1915. This was the first appropriation, outside of private contributions, made for the eradication work.

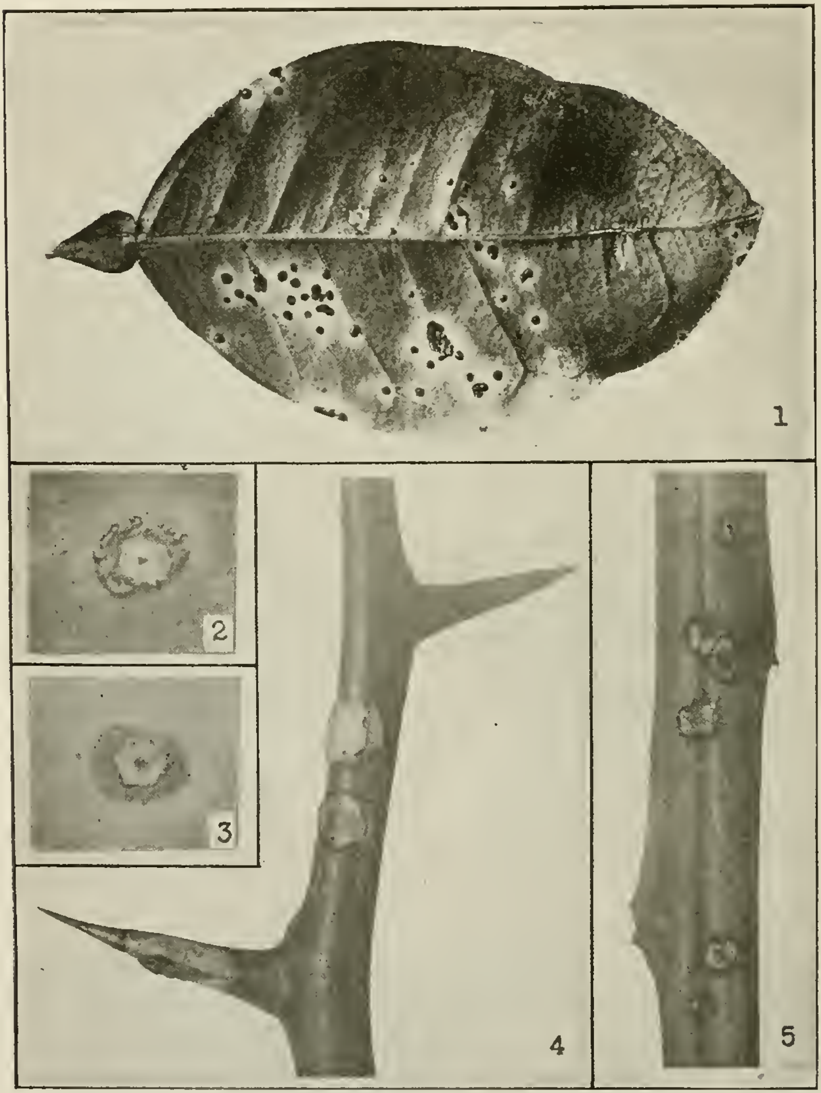
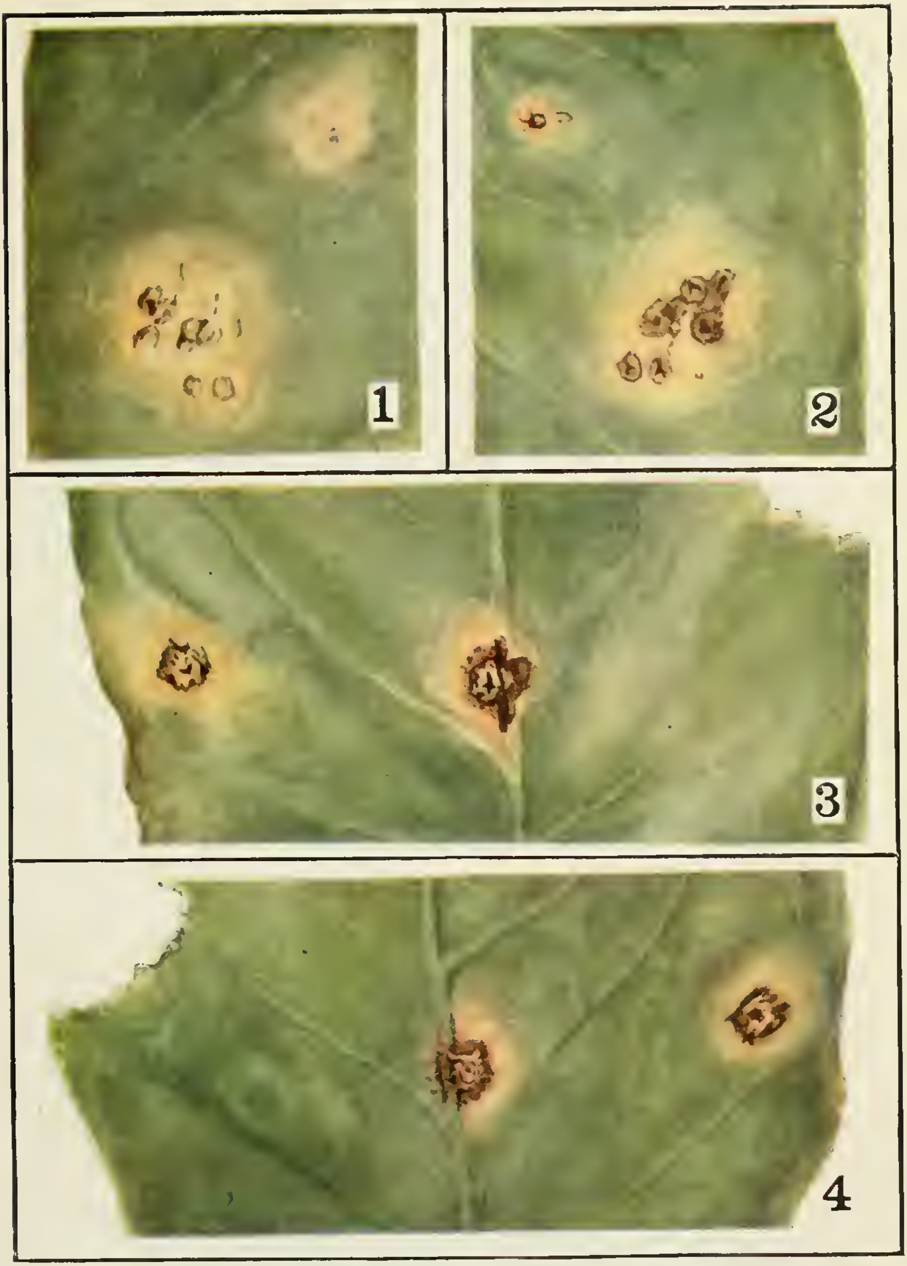


FIG. 74.—Citrus canker: (1) lower surface of grapefruit leaf infected with canker, showing the circular raised spots surrounded by yellow halos; (2) mature canker infection on upper surface of grapefruit leaf, showing crater-like appearance; (3) lower surface of leaf shown in (2); (4) infection on twig and thorn of *Citrus trifoliata*, showing longitudinal splitting of the membrane; (5) infections on grapefruit twig. No. 1, natural size; Nos. 2, 3, 4 and 5, enlarged three diameters. (After Jehle, Quarterly Bul., State Plant Board of Fla.)

PLATE II.



CITRUS CANKER ENLARGED.

1. Young canker on lower surface of grapefruit leaf. 2. Upper surface of same leaf. 3. Mature canker on upper surface of grapefruit leaf. 4. Lower surface of same leaf. All enlarged three diameters. Collected in South Dade County, Florida. (Courtesy Florida Plant Board.)

The emergency created by the occurrence of citrus canker was largely responsible for the passage of the Florida Plant Act in April, 1915, this act carrying with it an appropriation of $125,000 for eradication of the disease. This was followed, on February 28, 1916, by a congressional appropriation of $350,000 for canker eradication in the United States. Since the latter date the Bureau of Plant Industry of the Department of Agriculture has cooperated in the eradication work in all of the states affected.

The development of the eradication work has been so rapid and extensive that in an article of limited length one can give no more than greatly condensed summaries. In the first place there has not been nearly as much citrus canker in Florida as the public in other states has come to believe. Since the beginning of the eradication work in May, 1914, the disease has been found in a total of but 443 properties. The number of commercial grove properties in the state is probably not less than 50,000, so it is seen at once that no considerable area, even in the aggregate, has been allowed to become infected. Of the 443 properties which have been infected the quarantine has been raised on 306, leaving but 137 properties now classed as "infected." Of these 137, many have shown no infection for several months. The number of infected grove trees found in Florida from May, 1914, to February 28, 1917, was 13,354: the commercial plantings of the state aggregate in the vicinity of twenty-one million trees. Unfortunately, certain real estate and "development" interests, in their anxiety to promote sales, made the mistake of trying to deny the existence of any canker in Florida and thus gave impetus to exaggerated rumors which did incalculably more damage than plain statements of the truth would have done. Florida citrus growers, while realizing that canker uncontrolled would wipe out their industry, now feel that the enemy has been effectually bottled up and that his extinction is but a matter of months. The presence in the state of less than one hundred forty properties which are classed as infected has no perceptible effect upon either real estate values or upon the development of new plantings.

Under the nursery inspection system maintained by the Florida Plant Board, an accurate record is kept of the sale and movement of all nursery stock. The records of the nursery inspector show that 931,161 citrus trees were sold and planted out in Florida during the fiscal year which ended April 30, 1916. The new plantings during this year alone were therefore in the neighborhood of 13,000 acres—ample evidence that citrus canker is not now interfering with the development of the citrus industry in Florida.

METHOD OF ERADICATION.

The present method of eradication may be described as the sum total of three years' experience, during which time ineffective steps have been eliminated and effective ones improved upon and elaborated. For its success it depends upon three things:

First—A periodical, close inspection of all trees in properties which have been exposed to danger of infection, by trained inspectors capable of detecting the disease upon its very first appearance.

Second—The immediate destruction of the infected trees before opportunity is afforded for spread of the infection; and

Third—The rigid practice of sanitary and disinfecting measures in every operation, alike by inspectors and owners, in the infected and exposed properties.

Inspectors have been trained, for the most part, by serving apprenticeships under experienced men. This training has been supplemented by schools of instruction and periodical examinations. Only men of the highest moral and intellectual type available have been employed, and one requisite for the inspector is keen eyesight. The skill attained by some of the inspectors is little short of marvelous. Inspectors have been known to "pick up" minute canker infections on the topmost leaves of trees from twenty to thirty feet in height.

While engaged in inspection work the men wear union suits of white cloth which cover their other clothing; also cloth hats, high shoes and canvas leggings. Suit, hat and leggings are disinfected by dipping in corrosive sublimate solution, one part to one thousand, shoes are disinfected by stepping into the disinfectant, and face, arms and hands by washing with the solution both before and after inspecting each property. This inspection outfit and the disinfecting precautions are employed in all inspection work, even in properties many miles removed from any known center of infection. When an infected tree is discovered the inspector disinfects his entire suit and outfit before proceeding further, being allowed to touch the infected tree

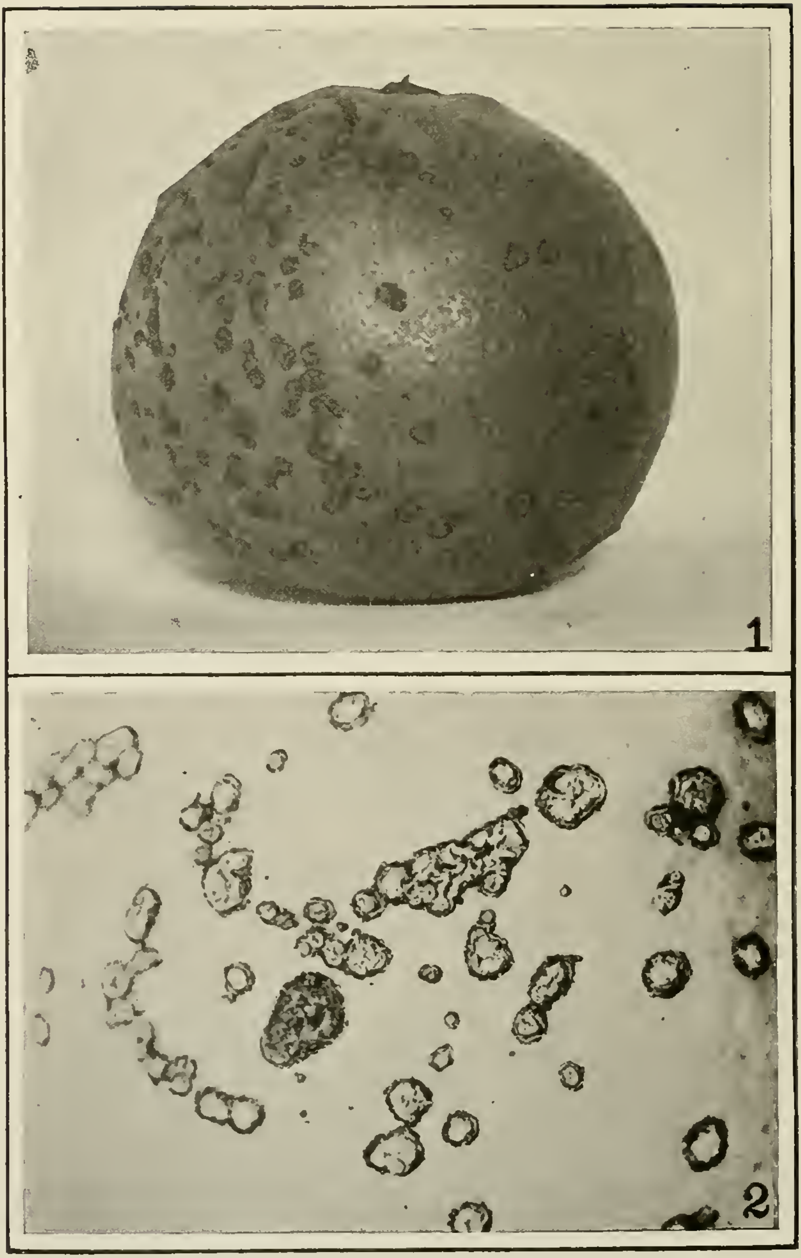
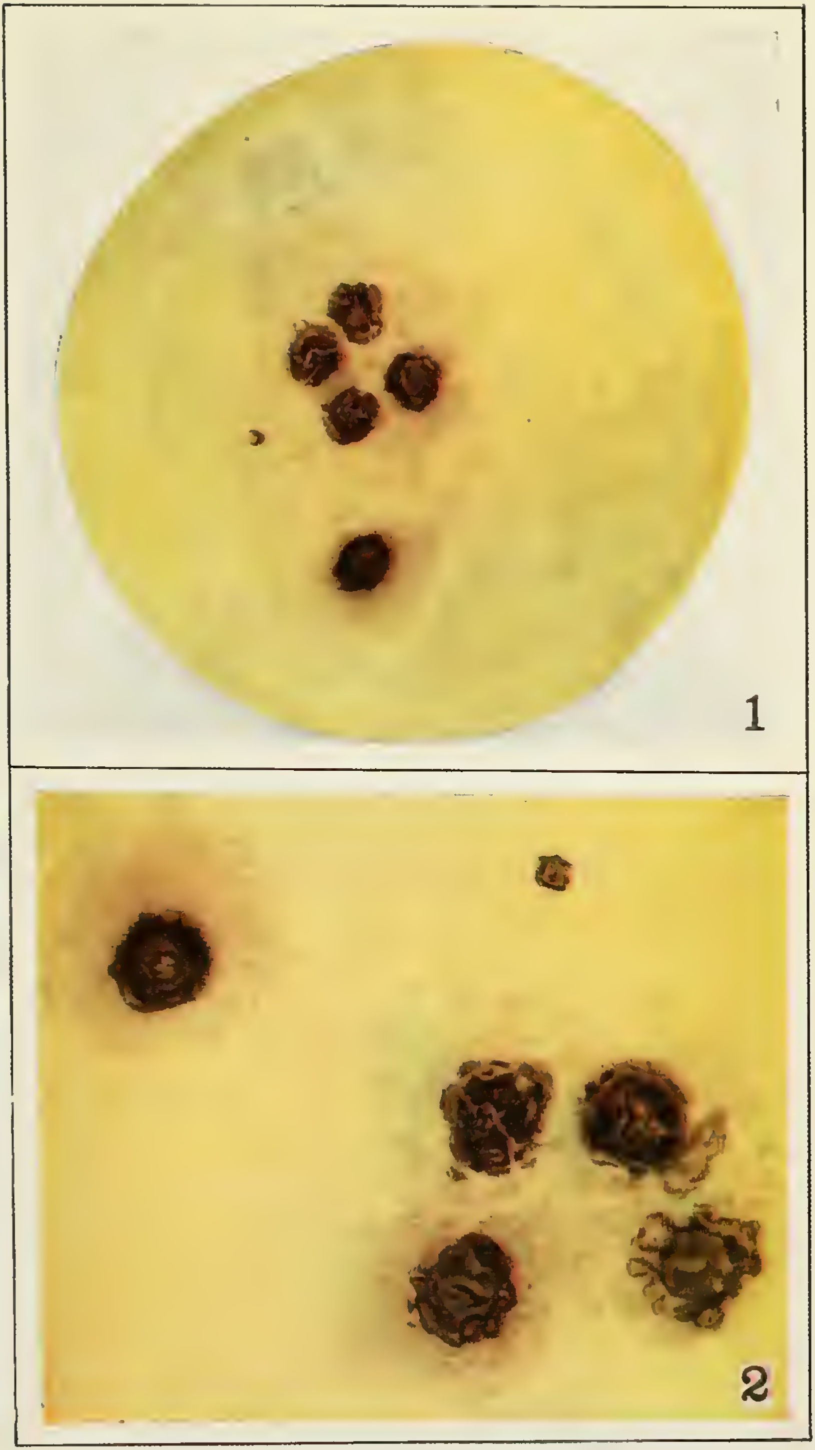


FIG. 75.—Citrus canker: (1) canker on green grapefruit, natural size; (2) portion of surface of same fruit, enlarged three diameters. (After Jehle, Quarterly Bul., State Plant Board of Fla.)



CITRUS CANKER ON GRAPEFRUIT.

1. Mature canker on grapefruit, natural size. 2. Portion of the same fruit represented above, enlarged three diameters. Collected in South Dade County, Florida. (Courtesy of Florida Plant Board.)

only for the purpose of taking, under aseptic precautions, a specimen of the disease for record. Even in the inspection of noninfected properties the inspectors are not allowed to brush against, touch or come in contact with the trees. When it is necessary to examine the underside of a leaf or spread apart a bunch of leaves for examination a twig is taken from the ground and used for the purpose and the twig is left under that particular tree. Inspectors work in squads of four, one of whom is the foreman in charge of the squad. The foreman is held responsible for close attention to work by the members of his squad and unnecessary conversation is prohibited. The foremen are directly responsible to the district inspector, the territory assigned to the district inspector varying from a few square miles to one or more counties, depending on conditions and the probability of recurring infections. The district inspectors are directly responsible to the plant commissioner and the general inspector who have general direction of the work throughout the state.

When an infected tree is discovered, a specimen is taken to supplement the record and as future confirmaton of the inspector's identification. In the event that the inspector's diagnosis is questioned by the grove owner, or if there is any uncertainty in the minds of the inspectors themselves as to the nature of a suspicious condition, a complete laboratory investigation is made which conclusively determines the identity of the condition under observation. A written notice is then served upon the owner to destroy the tree in the prescribed manner within forty-eight hours, this length of time being granted him under the Florida law and regulations in which to appeal from the inspector's order. At the same time the owner's consent for immediate destruction of the infected tree is solicited. This permission is invariably granted so that as a matter of fact infected trees are usually destroyed within five hours after they are discovered. In many instances the owners of infected properties give a standing permit for destruction of all infected trees which may be found and in this case destruction immediately follows the discovery of the infected tree. The tree itself is sprayed with kerosene until the foliage and limbs are dripping and the ground under the tree thoroughly saturated with oil. A burning match is then thrown into the tree and the oil spray continued until all leaves and twigs are consumed by the fire and every particle of surface on trunk and limbs thoroughly charred. The ground under the tree and for several feet in all directions is also burned off. The sight of a bearing orange or grapefruit tree being consumed by a roaring flame has brought tears to the eyes of more than one strong man and is a sight never to be forgotten; yet it is the application of such drastic measures to the infected trees that has made eradication possible.

After the infected tree is burned the trunk and roots are grubbed out, piled on the former site of the tree and burned. Thereafter the ground where the tree stood, and for several feet around it, is saturated to the depth of several inches with a solution of 4 per cent formaldehyde.

Owners of properties in which infection has been found are required to perform all work, such as fertilizing, hoeing, etc., under the supervision of an inspector of the State Plant Board and with the same precautions as to disinfecting as are employed by the inspectors in their work.

QUARANTINES.

Under the rules of the State Plant Board, the planting or movement of citrus trees or plants in an infected property is prohibited and the planting of citrus trees within one-half mile of an infected property is prohibited until such time as the board declares the infected property no longer a "danger center." In practice such declaration is not made by the board until it is confident that the disease has been eradicated and is not ordinarily made until from ten to eighteen months—depending upon conditions—have elapsed without any infection being found. The movement of any citrus trees from a point within one mile of an infected property is prohibited. Under the latter provision of the rules all citrus nursery stock is under quarantine when located within one mile of known infection and under another rule is under quarantine if it has been entered by any person, implement or thing which has likewise entered a canker-infected property. Since the adoption of these rules in May, 1915, no instance has been found of the disease having been disseminated on nursery stock.

PROGRESS OF ERADICATION.

The fact that the State Plant Board has declared as being no longer "danger centers" 306 properties out of the 443 which have been found infected since May, 1914, leaving only 137 properties now classed as infected, indicates the rapidity with which centers of infection have been cleaned up. The following figures show the number of infected trees found each month in Florida, and furnish ample evidence that the disease is decreasing rapidly:

Number of Grove Trees Found Infected With Canker, Per Month, Since the Work Began in May of 1914.

1914		1915		1916		1917	
		Jan.	306	Jan.	86	Jan.	14
		Feb.	165	Feb.	21	Feb.	4
		Mar.	444	Mar.	49		
		April	408	April	49		
May	108	May	1,042	May	338		
June	160	June	772	June	450		
July	275	July	651	July	349		
Aug.	1,313	Aug.	1,345	Aug.	219		
Sept.	767	Sept.	618	Sept.	121		
Oct.	565	Oct.	214	Oct.	451		
Nov.	773	Nov.	494	Nov.	131		
Dec.	366	Dec.	256	Dec.	27		

It is confidently anticipated that the continuation of the eradication work in Florida for two more years upon the present scale will result in practical eradication and that but few if any infections will be found at the end of that period. Owing to the fact that the disease may under certain conditions remain dormant for several months before becoming visible, the inspection of citrus properties in areas where the disease has occurred will necessarily be continued for several years longer as a precaution. In fact, it is a question whether inspection should ever be entirely discontinued in the citrus-growing areas of the United States.

Several important lessons have been taught us by the experience with citrus canker. The first of these is the necessity for an efficient quarantine service against all dangerous insect pests and diseases, unknown as well as known. California growers may ascribe their good fortune in thus far escaping first-hand experience with this dread disease to the excellent quarantine which has been maintained by the California Commission of Horticulture.

The second lesson is that sanitary methods and antiseptic precautions in dealing with a disease of plants are as necessary as the use of these same measures by physicians when dealing with infectious diseases of human beings.

Finally, and perhaps the most important of all, is the demonstration of the possibility and practicability of completely eradicating a plant disease over a considerable area and that such eradication, even at the expenditure of comparatively huge sums of money, is a good investment and much better than carrying on a partially-effective, prolonged warfare by means of so-called "control" measures.

THE WHITE PINE BLISTER RUST AND THE CHESTNUT BARK DISEASE.

By E. P. Meinecke, Forest Pathologist, Office of Investigations in Forest Pathology, Bureau of Plant Industry, San Francisco, Cal.

One of the outstanding features of progress in the nineteenth century was the tremendous impetus given to international commerce through means of rapid transportation and a corresponding specialization of industries. In this give and take of products man has not always been able to guard against the incidental movement back and forth of undesirable or injurious organisms of the animal and vegetable kingdom. Often he has become aware of the presence of the enemy only when it was too late. Ignorance and negligence have in the past permitted the introduction of the phylloxera into the vineyards of Europe, with its disastrous results, and the invasion of the United States by a host of injurious parasites and pests.

All practical control of plant diseases and insect pests is based on two principles, viz, the fight against existing established evils and the prevention of their introduction from the outside into territories not yet invaded. The former yields remarkable results in a great many troubles, such as San Jose scale and many crop and orchard diseases, but is almost hopeless in others unless unlimited funds are available. The latter consists in a well-reasoned and organized quarantine.

It has become necessary in recent years to organize a vigorous campaign against two most serious forest tree diseases, the white pine blister rust and the chestnut bark disease. The latter is firmly established in the East. The white pine blister rust has gained an alarming foothold in the eastern part of the United States, but still the fight presents good chances for success if only it is kept up with energy and perseverance (Fig. 76). The western part of the United States is still free from both. It is imperative that both be kept out of the West by all possible means.

WHITE PINE BLISTER RUST.

The white pine (*Pinus strobus*) is a typically American tree, but the fungus which causes the white pine blister rust is not indigenous to this country. It came to the United States from abroad.

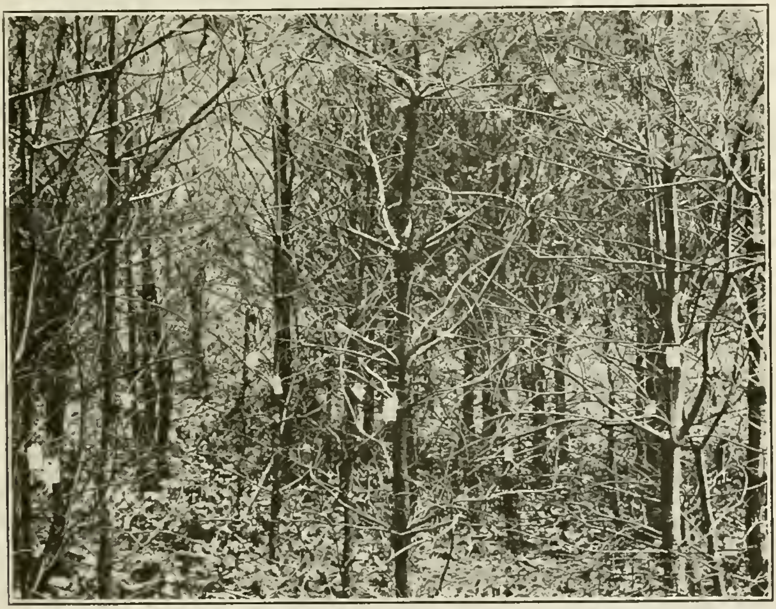


FIG. 76.—Thick stand of 13-year-old white pines heavily infected with white pine blister rust (*Peridermium strobi*). Each white tag marks a separate infection. (Photo by J. F. Collins.)

As contrasted with North American forests, those of Europe are poor in species. With the progress of European forestry and the economic necessity of raising their productiveness to the highest pitch, the attention of foresters, in the search for promising foreign trees, was from an early date on attracted by the white pine. This species combines a number of most valuable qualities. It is unusually fast-growing and its yield in lumber is extraordinarily high, compared to other pines. It is not particular as to soil, growing luxuriantly in swampy ground and doing very well in sandy soils. The tree resists even the lowest winter temperatures. The wood is very durable; it works easily, does not warp or check.

The tree was first introduced into England in 1705 and has spread from there over the continent. Some plantations of Germany are more than a hundred years old.

One of the most valued qualities of the tree was its apparent resistance to disease. Forty to fifty years ago a disease of white pine seedlings, which affected the young stem and killed the plants, was discovered abroad, without at the time causing much alarm. It was not until much later, about the nineties of the last century, that European foresters began to realize the importance of the disease. The nurseries suffered increasingly serious losses, and at the present day the cultivation of this valuable tree has practically been discontinued in England, Holland and Denmark, while in Germany and France it appears to be simply a question of time when white pine will no longer count in the scheme of forestry.

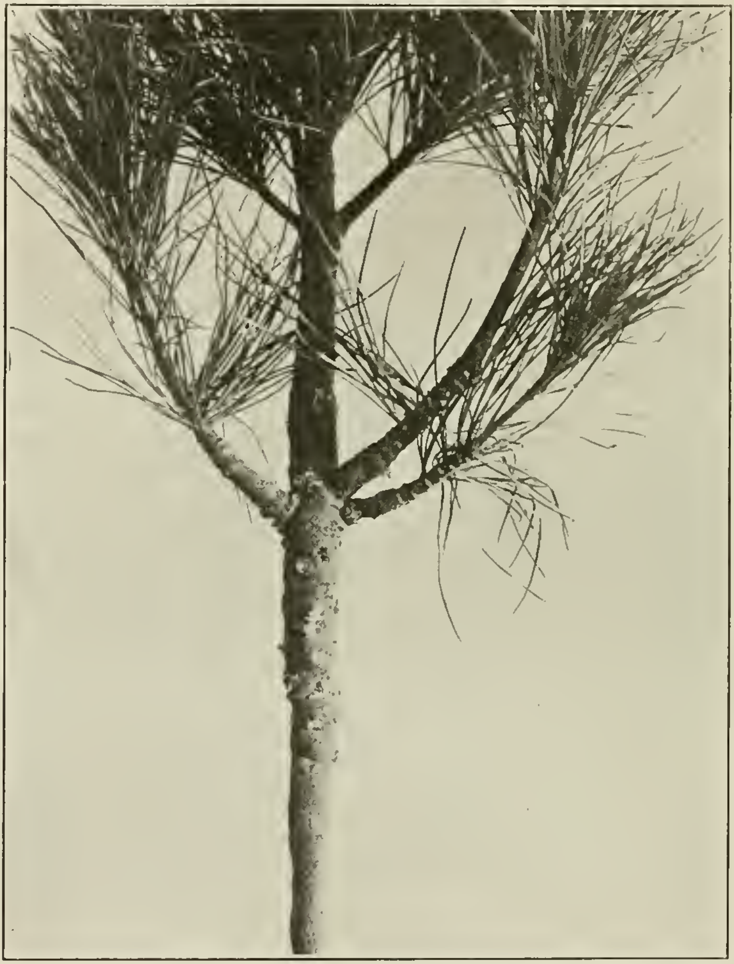


Fig. 77.—White pine seedling infected with white pine blister rust (*Peridermium strobi*). On the swollen stem the æcia appear in shape of white delicate bladders. The æcia have broken open and are shedding the æciospores. (Photo by C. R. Pettis.)

The origin of the disease is not definitely known. In all probability it is indigenous to western Siberia and eastern Russia, where it attacks the stone pine (*Pinus* *cembra*), a relative of white pine. With this pine it was probably introduced into western Europe, where the extended nurseries and plantations of white pine furnished rich material for its attacks. It is on nursery stock of white pine imported from abroad that this Siberian disease was introduced into the United States.

We have here the curious case of an American plant, sound in its native country, contracting an introduced Siberian disease in western Europe, and on its return to America carrying the disease with it. Its presence in the United States became noticeable in the first decade of this century, although there may have been isolated cases in earlier years.

The fact that the white pine blister rust has not appeared at a very much earlier date in western Europe, in spite of an absolute lack of a protective quarantine against Russia in the first half of the last century, can only be explained by the absence of susceptible native pines in the forests. Planted white pines at that period were still rather rare and the disease had no chance of establishing itself until it found the ground sufficiently prepared. The case is entirely different in the eastern United States, where white pine covers vast tracts of land and offers ideal conditions for the rapid propagation of the disease. In Europe the entire problem will be solved by excluding white pine again from cultivation and returning to the state of affairs before the introduction of this species which after all never formed an integral part of the European forests. In the United States, on the other hand, one of the most important members of the forest community is in immediate danger, and in addition the related species, amongst others the most valuable pine of the Pacific coast, sugar pine, are jeopardized.

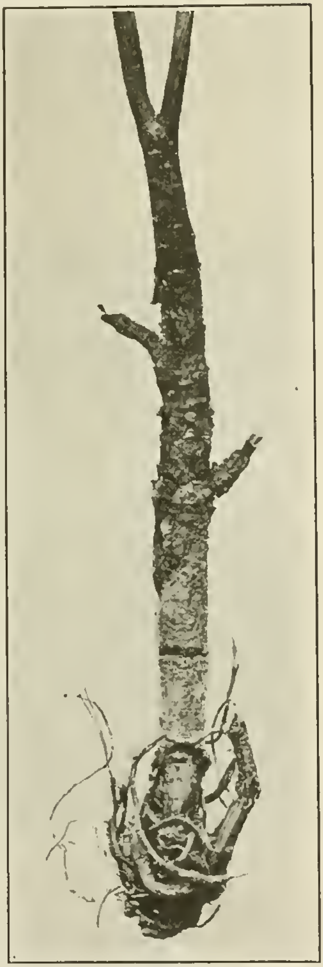


FIG. 78.—White pine seedling killed by white pine blister rust. Appearance of bark after death. (Photo. U. S. Department of Agriculture.)

CAUSE OF THE DISEASE.

The white pine blister rust is caused by a parasitic fungus belonging to the Uredineæ (rust fungi), a family of which all members are parasites. The name "rust" is derived from the rusty appearance so commonly found on affected parts of the host plant. This rust consists of heaps of the minute spores or reproductive bodies of the fungus plant, which, when carried on to other susceptible host plants, will germinate under favorable conditions, enter the tissues of the host plants and by growing in these again produce the disease. In our case the blister rust represents the fungus, while the white pine acts as the host.

But white pine is not its only host. We have already seen that the fungus occurred on *Pinus cembra*. Both are five-needle pines; that is, having five needles in a bundle. It is an established fact that other five-needle pines, such as sugar pine (*Pinus lambertiana*) and western white pine (*Pinus monticola*), are subject to the attacks of the fungus. Most probably all five-needle pines will be found to be susceptible. Other pines, for instance the three-needle pines, to which yellow pine (*Pinus ponderosa*) belongs, are immune.

The matter is further complicated by the fact that the fungus does not pass its entire life on five-needle pines. The spores formed on pines can not infect other pines. They are able only to infect the leaves of currants and gooseberries, where they produce a disease of an entirely different character and aspect from that on the pine. The name white pine blister rust proper applies to the form on the pine. On currants and gooseberries we speak of currant and gooseberry rust. It is from this latter form that the fungus takes its technical name *Cronartium ribicola.*

Before it was known that both forms were really nothing but the manifestation of the same fungus on two different host plants, the blister rust on pines was called *Peridermium strobi* and this name is still used when one wishes to designate that particular stage of the fungus.

To sum up, *Cronartium ribicola* is the name of the fungus as a whole, taken from the form on currants and gooseberries, while *Peridermium strobi* designates only the blister rust on the pine. The pine plays the role of an "alternate host" in the life history of the fungus. After having passed through the stage on currants and gooseberries the fungus is again able to infect the young stems of five-needle pines. In this cycle the fungus develops several different types of spores.

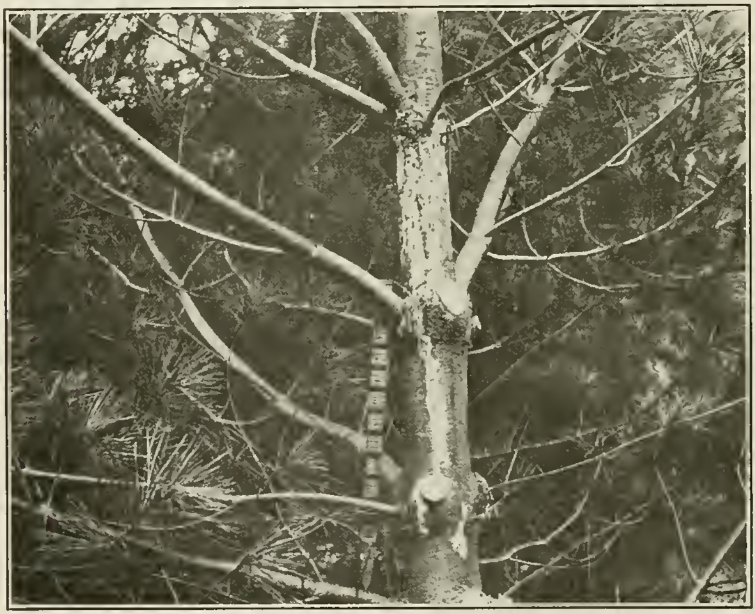


FIG. 79.—Older white pine tree with white pine blister rust, showing heavy resin flow. (Photo by J. F. Collins.)

After the infection of a young pine has taken place the fungus grows in, and feeds on, the living tissues of its host until it has reached a stage in which the first type of spores is formed. This appears in the shape of small, clear, honey-yellow droplets exuding from minute bladdery swellings on the bark of the young stems. The drops have a sweet taste and consist of very small spores, so-called pycnospores. The small bladdery swellings in which the spores are formed are called pycnia (Fig. 81, No. 1). Nothing is known regarding the functions of these spores.

The pycnospores are later followed by the formation of fairly large protruding white bladders containing an orange-yellow powder, which consists of a different type of spores, the so-called æciospores (Fig. 81, No. 2). The bladders in which they are contained are known as æcia. They correspond to the so-called cluster cups of other rust fungi. This stage is by far the most conspicuous (Fig. 77).

The æciospores develop in spring, according to climate and local conditions in April and May or June. Soon the bladders open and the spores drop out in form of a dry powder. This dusting of æciospores continues for some time. Later the production of spores ceases, the thin white membrane which forms the wall of the bladder drops off and nothing is left but a discolored scar (Fig. 78). Unless the young pine is killed, the infected part continues to produce new æcia for a few years.

Pycnospores and æciospores are the only forms of spores of the fungus produced during its life on the pine.

Meanwhile the fungus itself, the fungus plant, has been living in the young stem, sending the delicate threads which make up its body through the young living bark of its victim and taking all its food from that source. For a long time, sometimes for several years, the host plant, the pine, does not show any external effects of this parasitism. Later the result of the continued irritation caused by the presence of the living parasite in its tissues becomes visible in form of an excessive growth of the affected stem. It begins to thicken locally and finally produces long spindle-shaped swellings which are often thicker at the upper end than below. Both the pycnia and the æcia appear on these swellings. On older stems heavy resin flow

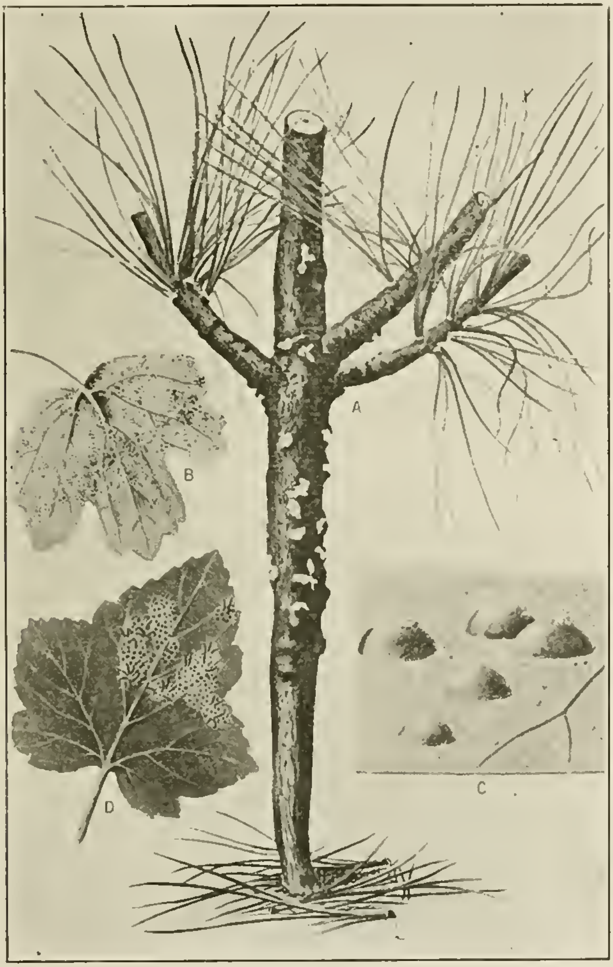


FIG. 80.—*Cronartium ribicola.*

A. White pine blister rust on young white pine.
B. Uredinial stage on the underside of Ribes leaf.
C. Uredinial pustules on Ribes leaf, enlarged.
D. Teliospores united in form of short threads (*Cronartium*) on the underside of Ribes leaf.

(From Bureau of Plant Industry Bull. 206.)

indicates the presence of the fungus (Fig. 79). It is merely a question of time how long the host can withstand the attack of the fungus it harbors. In the end the host succumbs. With the death of the young pine the fungus plant itself dies off, but before this happens, it has shed myriads of æciospores which are carried about by the wind and assure the propagation of the fungus on the condition that they reach a member of the Ribes family, to which currants and gooseberries belong. Unfortunately the susceptible five-needle pines are generally associated with these plants, of which only comparatively few seem to be resistant to the spores of the white pine blister rust.

With the shifting of the fungus from pine to Ribes a complete change in habits and appearance takes place. The fungus which was strictly confined to the living bark of young pines, now chooses the leaves of currants and gooseberries for its domicile. Æciospores landing on susceptible leaves germinate under favorable conditions by sending out a very delicate germ tube, which grows into the leaf and here again parasitizes the tissues as its mother plant had done in the pine. After this young fungus has grown by taking its food from the tissues of the leaf, it is ready to produce a third spore form, the so-called urediniospores. Their formation is first signalled by the appearance of very small yellowish pustules on the underside of the infected leaf, which soon break through the epidermis and begin to shed the yellow spores (Fig. 80, B, C). These urediniospores (Fig. 81, No. 3), being able to infect other leaves of currants and gooseberries, spread the fungus within a very short time over a great many Ribes plants and thereby materially extend the radius of the fungus within one summer. It only takes two weeks from the time the urediniospores have landed on a Ribes leaf to produce another generation of urediniospores, and as the production of these spores may continue throughout the summer, it is readily seen that the fungus possesses in these spores a most effective means of propagation and rapid dissemination. On the other hand, the urediniospores are unable to infect white pine plants. Their life is strictly confined to currants and gooseberries. With the death of the infected leaves and their dropping off in fall the Ribes generation of the fungus also perishes, but again ample provision is made for propagation. From the middle of summer on a fourth type of spores, the so-called teliospores, follows the production of urediniospores on the underside of the leaves. They appear to the naked eye as short hair-like horns or threads of a brown color, which are composed of numerous teliospores firmly glued together (Fig. 80, D). This type of spores is unable to infect Ribes leaves. Their function is to carry the fungus back to five-needle pines. Since the telispores (Fig. 81, No. 4) are not shed in form of spore dust, but remain united in the form of a small thread-like structure, there would be little chance for their being carried bodily on to the bark of pines. Another secondary type of spores, the so-called sporidia (Fig. 81, No. 5), is necessary in order to reach the host. The very small sporidia are produced as a result of the germination of the teliospores; they are easily detached and are carried off by the wind. When they land on the bark of a young pine its infection takes place and the life cycle of *Cronartium ribicola* is completed. The result of the infection of the young pine is again the blister rust, with first the swelling of the stem, then the sweet pycnial drops and the typical white blister filled with orange-colored spores (Fig. 81).

It is on pine where the fungus shows itself from its worst side. The telial (*Cronartium*) stage never kills a currant or gooseberry bush, although it is well known that a heavy infection of Ribes prematurely kills individual leaves in considerable number and thereby materially weakens the entire plant. Where currants and gooseberries are cultivated for their fruit or for ornamental purposes the loss from a heavy infection will make itself severely felt. But the real importance of the Cronartium form on Ribes lies in the great facility with which the disease is spread over large areas through the urediniospores and in the formation of the teliospores which provides for the return of the fungus to the pine.

The enormous damage it is able to inflict upon some of our most valuable timber trees lifts the fungus from the rank of nuisance to that of an economically portentous enemy, to be fought by all means. On five-needle pines the fungus is not content with local injuries; it kills. It does not kill indiscriminately, but confines itself to young trees or the younger parts of older trees. In Europe it appeared typically as a disease of seedlings and in America it does its greatest damage to young trees up to about thirty years of age, though 100-year-old trees also have been known to be killed. The very fact that it attacks and destroys the future of the white pine forest in the shape of seedlings makes it all the more insidious. Our country as a whole has not yet learned to think seriously in future values.

Already the white pine forests of the East are in jeopardy. If the blister rust is allowed to gain a permanent foothold in those forests, the future of the white pine and with it the industries dependent upon it are doomed, at a loss of hundreds of millions of dollars. The time when this effect will be seriously felt is not far off. Granted that there is at hand a large stock of merchantable timber, in the natural course of things this stock will be cut out within the next decade and the younger age classes move up into the mature class of trees ready for the axe. But if the younger trees are killed off by the blister rust there will be no timber in the future large enough to be utilized. If the present fight against the fungus is not successful, the first economic effect will be felt within twenty to thirty years. The situation is alarming now: it will be critical or hopeless then, as it is in Europe, with this difference that the values at stake in this country are immeasurably greater than those abroad.

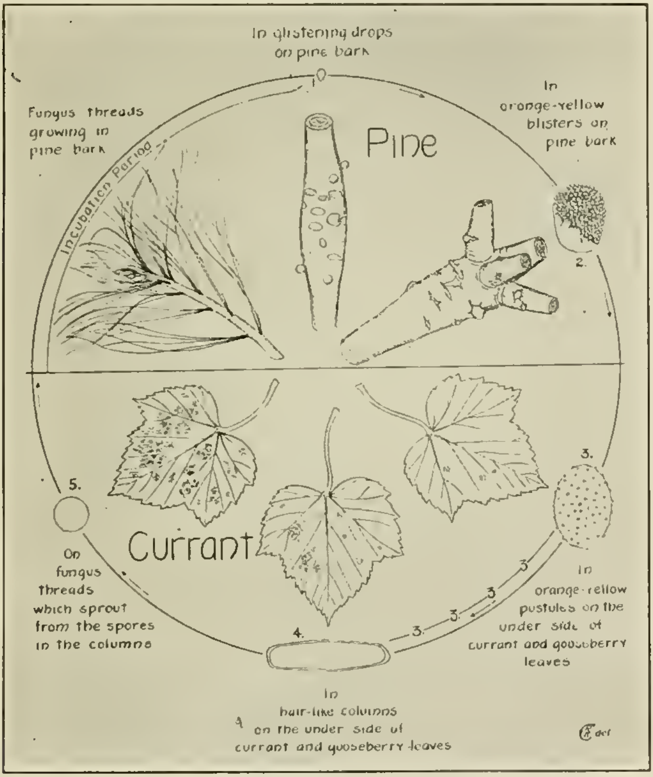

In glistening drops on pine bark
1
Fungus threads growing in pine bark
Incubation Period
Pine
In orange-yellow blisters on pine bark
2.
3.
Currant
5.
On fungus threads which sprout from the spores in the columns
3
3
3.
3.
In orange-yellow pustules on the under side of currant and gooseberry leaves
4.
In hair-like columns on the under side of currant and gooseberry leaves
4
E. del

FIG. 81.—Life cycle of *Cronartium ribicola*.

No. 1. Pycnospore.
No. 2. Aeciospore.
No. 3. Urediniospore.
No. 4. Teliospore.
No. 5. Sporidium.

(U. S. Department of Agriculture.)

The white pine forests of the East are not the only assets in danger from the blister rust. The monetary values stored in sugar pine and western white pine in the West amount to hundreds of millions of dollars, while the role both trees play in the beauty and grandeur of the forests of the West can not be expressed in dollars and cents. So far the disease is unknown in the home of either sugar pine or western white pine; but both trees in cultivation abroad have contracted the disease exactly as white pine had done before, and just as the blister rust was brought into America in shipments of young living white pines, the disease may at any time be introduced into the western forests on nursery stock coming from an infected territory. In this way a single diseased white pine introduced into a nursery, cemetery, private garden or park of the West may become the starting point for an epidemic of disastrous consequences. A similar danger threatens from the importation of living currants and gooseberries.

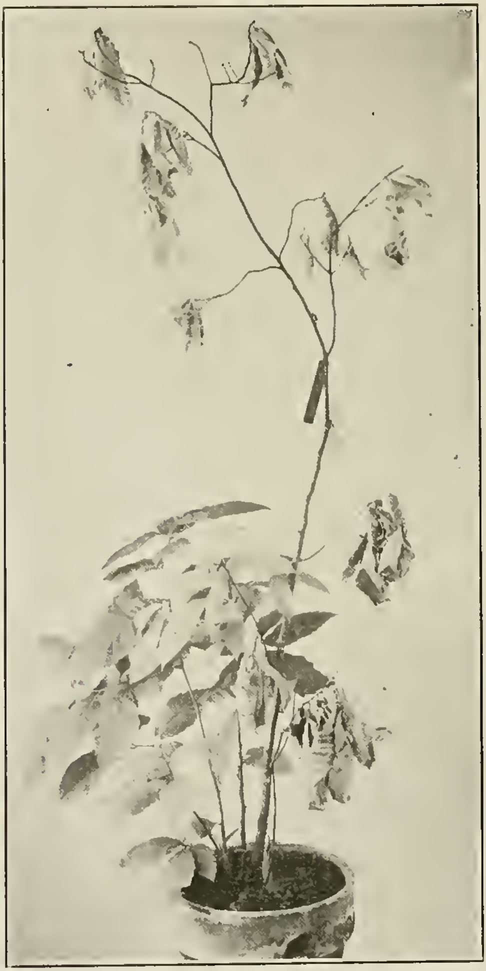


FIG. 82.—Chestnut bark disease. The main stem of the chestnut plant has been artificially inoculated with *Endothia parasitica*. The result of the infection is shown in the drooping and shriveling of the foliage. (U. S. Department of Agriculture, Yearbook 1912, Pl. 37.)

The eastern white pine forests are separated from the western five-needle pines by the natural barrier of the Great Plains. There is little danger of the fungus jumping this barrier except through shipments of stock, or more slowly through a chain of cultivated or wild currants and gooseberries. It follows that protection of the hitherto untouched western part of the country can only be effected by a careful watch of its frontiers and rigid exclusion of all stock coming from the outside.

CHESTNUT BARK DISEASE.

One of the most popular trees of the Eastern States is the American chestnut. As a forest tree it yields large quantities of excellent lumber. As a much prized and highly ornamental shade tree it graces parks and gardens, and in orchards it produces sweet nuts in abundance which form a nourishing food. Estimates of the total value of chestnut vary from 300 to 400 million dollars. The total value of chestnut products (lumber, poles, ties, etc., and tanning extracts), not counting the nuts, in the year 1911 reached almost $20,000,000. Virginia alone in the same year exported $200,000 worth of nuts. Of the enemies of the American chestnut at that time little was known. The tree seemed to be fairly immune from serious diseases.

In the year 1904 a disease, killing twigs and branches, was observed in the New York Zoological Park without at the time attracting much attention. In the following year it had made such progess that serious alarm began to be felt. In 1911 it had spread over at least ten eastern states and the damage was very conservatively estimated at $25,000,000. Huge as this figure seems, it is trifling compared to the total value of the chestnut stand which now is in imminent danger of complete destruction.

The virulence of the attack and the rate of spread of the disease are without parallel in the history of plant diseases. The disease is absolutely fatal. Local attacks may, at great expense, be suppressed. Where the disease has once gained a firm foothold, its eradication is as good as impossible. The United States Department of Agriculture and the state of Pennsylvania have from an early date on undertaken extensive studies of the disease and have been active in its control, partly in the suppression of local outbreaks, partly in preventing the spreading and establishment of new centers.

The disease was first believed to be of American origin. Not until 1913, however, was it found that the disease was indigenous to China and widely spread in Japan. In both countries the actual damage to native chestnuts, though noticeable, does not reach alarming proportions. There remains no doubt that the disease was actually introduced from Japan into the United States, where it found a particularly susceptible host in the American chestnut (*Castanea dentata*).

The disease shows plainly from a distance. The first symptom of attack manifests itself in discoloration, wilting and drooping of the foliage (Fig. 82), which persists on the tree during the winter. After the winter storms have removed the leaves of the stem or branch attacked, the latter stand out naked from the green foliage of the still healthy part of the tree. An attack during the early part of summer will prevent the burs from developing to their full size. A late attack finds the burs fully developed. In this case the burs remain on the tree during winter, instead of dropping off in fall (Fig. 83). Another symptom of the chestnut bark disease consists in the formation of suckers at the base of killed stems. It is the same tendency of regeneration found so commonly in broad-leaf trees after felling or girdling. In fact, the effect of the disease is the same as that of girdling.

CAUSE OF THE DISEASE.

The disease is caused by a parasitic fungus, *Endothia parasitica*, which belongs to the Ascomycetes. The fungus gains an entrance through a wound in the bark and spreads more or less concentrically in all directions from this point (Fig. 84). It grows typically in the living bark of the chestnut, from where it is able to penetrate into the outer layers of the sapwood. The effect of the fungus on the chestnut soon becomes visible in the shape of dead patches or cankers. When these cankers have extended all around the stem or branch, the complete girdling kills off everything above. In this way whole trees may be destroyed within one season.

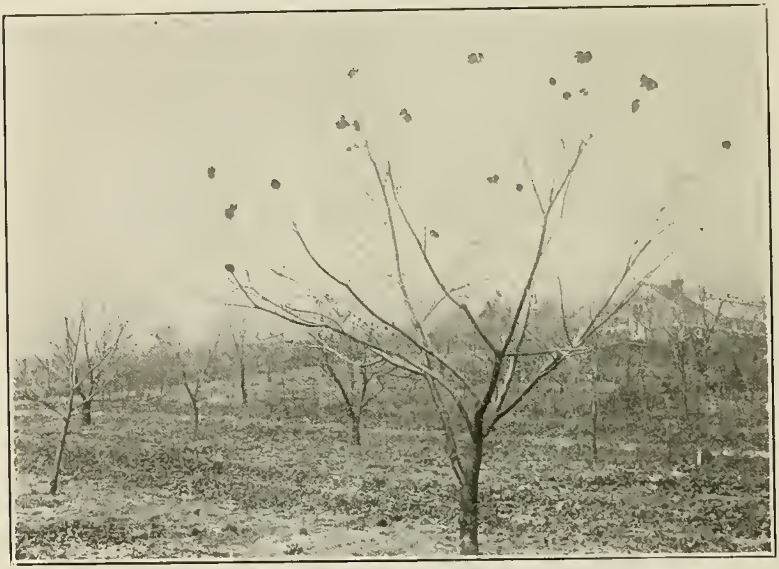


FIG. 83.—Chestnut orchard. The tree in the foreground has been killed during the last season, as shown by the persistent burs.

On young shoots the affected areas show rather conspicuous discolored sunken patches surrounded by the olive-colored normal bark from which they occasionally are separated by a raised margin. On older bark the patches are not as clearly recognizable. On peeling off the dead bark the mycelium—that is, the vegetative body of the fungus plant—appears in form of small white flakes, or later, in form of yellowish flat, distinctly fan-shaped masses. These "fans" are highly characteristic and serve as an excellent criterion in the determination of the chestnut bark fungus.

The means of propagation of the fungus from tree to tree are very simple. They consist of two forms of spores, the pycnospores and the ascospores. The cankers or dead areas are usually covered with innumerable small pustules of yellow, orange or reddish-brown color (Fig. 84). The pycnospores are the first to appear. They are formed in small yellow to orange-colored pustules (pycnia) from which they ooze out in the shape of thin, irregularly twisted coils or strings, each consisting of a great number of spores. Later, usually towards fall or winter, the second type of pustules (*perithecia*) appears. These are orange to reddish-brown, and contain great numbers of small sacs, each of which produces in its interior eight ascospores. Upon maturity the ascospores are ejected with some force from the pustules, but do not come out in strings as do the pycnospores.

Both spore forms may continue to be produced long after death of the affected part and both are able to infect sound chestnut bark.

As far as known only chestnuts and immediate relatives are known to be subject to the disease. The introduction of the fungus into California would spell death to all chestnuts. At present the chestnut industry of the Pacific coast can not be called important, but there can hardly be any doubt that with the disappearance of the eastern tree the cultivation of chestnut on the Pacific coast will be strongly stimulated. Raising chestnuts for consumption is far too profitable a business not to be tried in a climate so eminently suited to this industry. If the chestnut bark disease is permitted to reach the Pacific coast the future of this branch of horticulture will be doomed.

There is strong evidence that some oaks, in particular tanbark oak, are not immune. The danger to the tanbark oak industry of California from the introduction of the fungus is obvious. So far it appears that the giant chinquapin (*Castanopsis chrysophylla*), a very close relative of chestnut, is not subject to the disease. As long as this is not proved beyond the shadow of a doubt, the fungus must be regarded as a potential enemy of this magnificent tree. This chinquapin occasionally reaches six feet in diameter and up to 115 feet in height, and produces excellent saw lumber in a country exceedingly poor in valuable hardwoods.

The state of California has every reason by all means at its disposal to prevent the introduction of one of the most virulent and destructive fungi known to plant pathology.

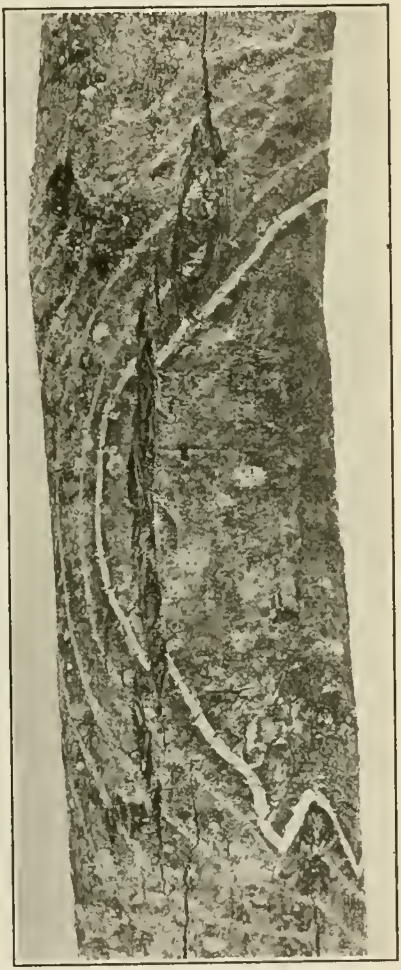


FIG. 84.—Chestnut stem with typical canker of chestnut bark disease. The concentrical advance of the fungus in the bark is marked with chalk. The older portions of the canker to the right are thickly covered with small pustules (*pycnia* and *perithecia*).

FIVE-LEAVED PINES.

By Frederick Maskew.

With an eye single to the protection of our sugar pine forests, at present covering an area of approximately five million acres in this state, Commissioner of Horticulture G. H. Hecke, on February 1, 1917, issued Quarantine Order No. 30, the provisions of which prohibit the entrance into the state of California of all five-leaved pines and other host plants of the white pine blister rust, originating within a certain defined area of the United States. Since the issuance of this order the central quarantine office is in constant receipt of inquiries from the state quarantine guardians as to the names of the several pines covered by this regulation. To place this information in a convenient, permanent form, readily available to all horticultural inspectors in the state, is the purpose of offering the following information for publication in the Monthly Bulletin.

The following list issued by the Federal Horticultural Board on June 3, 1913, enumerates the five-leaved pines, and in addition includes all horticultural varieties of the same in the prohibited list:

Pinus albicaulis
Pinus aristata
Pinus ayacahuite
Pinus balfouriana
Pinus bonapartea
Pinus cembra
Pinus excelsa
Pinus flexilis
Pinus koraiensis
Pinus lambertiana
Pinus mandshurica
Pinus monticola
Pinus parviflora
Pinus pentaphylla
Pinus peuce
Pinus pygmaea
Pinus strobiformis
Pinus strobus

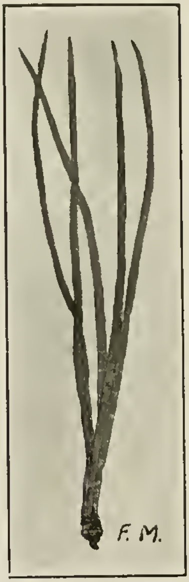


Fig. 85.—Fascicle of five-leaved pine.

MELANOSE OF CITRUS.

By H. S. Fawcett, University of California Pathological Laboratory, Whittier, Cal.

Melanose is a superficial marking of the surface of citrus fruits, leaves and stems. The most noticeable and serious injury commercially is that to the skin of the fruits, causing them to become rough and unsightly, and when severe, stunting their growth. The markings are small, raised areas with a wax-like appearance, varying from yellow to brown and sometimes black. The individual markings or specks (varying in size from mere points to areas one-sixteenth of an inch in diameter), show under the hand lens lines of breakage around the margins or across the surface, giving the appearance, on a miniature scale, of dry cracked mud, and when close together give the surface a flabby appearance. These markings may be distributed irregularly over the surface of the affected parts or, as is often seen, occur in half circles or in lines.

The disease was first noticed in Florida about 1892 by W. T. Swingle and H. G. Webber, and described by them in 1896. In 1912 the causal agent was shown to be *Phomopsis citri,* the same fungus that the writer had previously described as the cause of stem-end rot of citrus fruits in Florida. It appears to be the most severe in certain portions of Florida, although it is known to occur in Louisiana and other Gulf states in a mild form. As far as known it does not occur in Cuba, which is an important citrus section, nor has it ever been found in California.

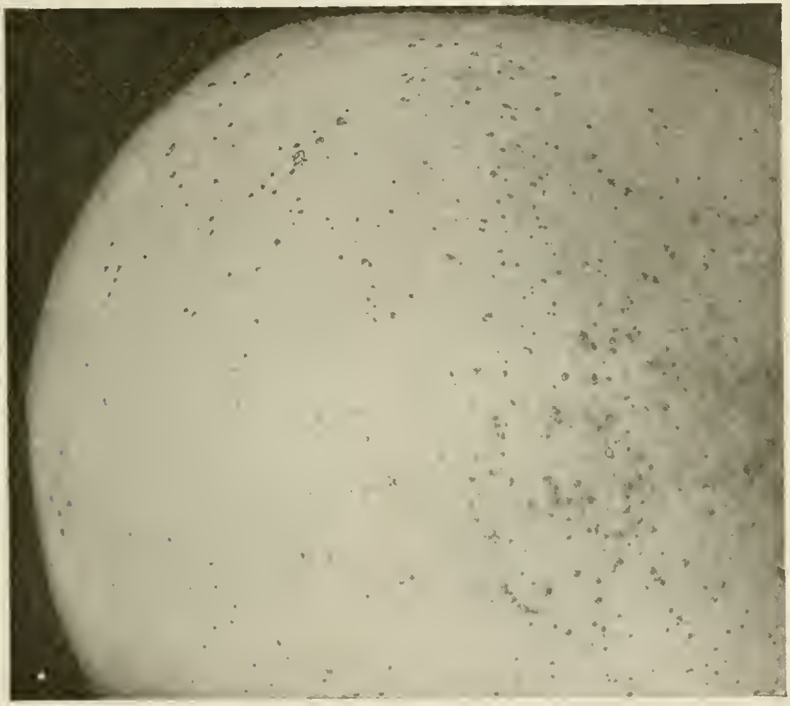


FIG. 86. Melanose (*Phomopsis citri*) on the skin of grapefruit. (Bul. 262, Cal. Agr. Exp. Station.)

This disease occurs on all varieties of citrus fruits in Florida, but it is perhaps most noticeable on grapefruits, because of the smoothness of the skin of that fruit. Melanose starts on leaves and shoots only when there is a flush of growth. On the fruit it may start at any time from just after the petals fall until late summer or early fall.

The fungus causing Melanose and stem-end rot lives most naturally in dead branches, and even in very small twigs, where in moist weather it produces countless numbers of minute spores. These spores are produced in small bodies in the bark that to the unaided eye look like dark specks or minute raised pustules on the surface of the dead bark. The fungus is probably spread in the tree chiefly by dew and rain. The spores are washed down from the dead twigs to the fruit, leaves and new growing twigs. Birds and insects are also, no doubt, instrumental in carrying the spores from tree to tree. Pruning out dead twigs and branches and spraying are the means used in Florida to control this disease.

PEACH YELLOWS AND PEACH ROSETTE.

By J. B. S. Norton, Agricultural Experiment Station, College Park, Maryland.

On account of its long history of destructiveness, its insidious nature and the mystery of its cause the yellows is the most dreaded of all peach diseases. The active propaganda, legal as well as educational, against it for many years, has also brought more notoriety to the yellows. As a matter of fact, the brown rot and possibly other ever present and less apparent diseases, in all probability, cause more actual financial loss to peach growers; but the loss of whole trees and, at times of special yellows outbreaks, the destruction of whole orchards in a few years, brings it to the attention of growers much more than the others.

The yellows disease is known only on the North American continent, and in the cooler parts; although the southern line of its distribution extends as far as Georgia, it is found only in the higher altitudes, and here, as well as further north, it follows more or less closely a line of similar temperatures. It occurs mostly on peach and nectarine, but has been observed on almonds, apricots and Japanese plums.

The yellows was noticed as early as 1760, and is thought to have started somewhere in Pennsylvania, near Philadelphia, and has apparently spread in all directions from that center to its present limits, which include Canada and New England as far north as peaches are grown, and from there south to Maryland and Delaware, the line of southern limit passing through central Delaware and across Maryland toward the southwest, then extending northward again up the Chesapeake Bay and again southwest from about Annapolis and into Virginia a few miles south of Washington, D. C., and thence south along the mountains far into the Southern States and back again west of the mountains and through the Central States, where its southern limit has not been certainly marked, to as far west at least as Arkansas and eastern Kansas; the northern limit in the West is not definitely known, but as in the East is no doubt determined by the limit of successful peach culture.

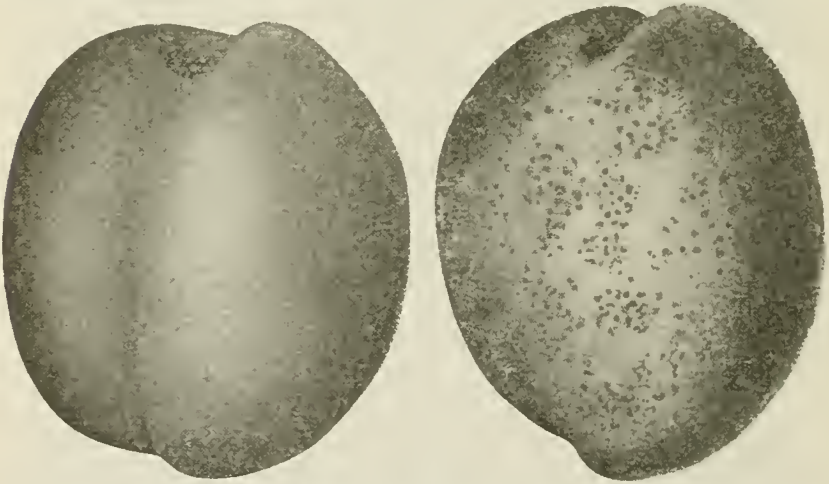


Fig. 87. Fruit showing effects of peach yellows. The peach on the left is a perfectly healthy specimen, while that on the right is affected with yellows. The spots are a bright red in color. (U. S. Dept. of Agriculture.)

In the affected region in ordinary years there is a loss of one to three per cent of the trees, or generally less than this in well cared for orchards where the diseased trees are promptly removed. But there have been a number of yellows epidemics (1791, 1806–07, 1817–21, 1845–58, 1874–76, 1886, 1888, and 1907–09) in which the loss has been much more.

The foliage characters of the disease are sometimes difficult to separate from the similar effects of other diseases. The yellows is most clearly recognized by its effect on the fruit. When trees in fruit are attacked the first indication of the disease is the prematuring of the fruit, this premature fruit having peculiar red spots on the surface and red streaks in the flesh. In many varieties the normal fruit has many minute red dots on the skin, but in the yellows fruit the spots are generally about one or two millimeters in diameter. The internal streaks run through all the flesh and not simply near the stone as in the partly red-fleshed varieties. In full red-fleshed kinds the spots are not distinguishable.

The premature fruits are the best character and, in fact, "prematures" is often used as the name of the trouble by many growers, and is indeed a better name than "yellows," which has unfortunately become the established name in literature, as there are many other causes of yellow foliage in peach, and often trees with this disease do not have yellow leaves for some time after they have the disease and have become a menace to the orchard. The fruit on diseased trees ripens from a few days to several weeks before the healthy trees of the same variety or before the unaffected branches of the same tree, for the disease usually shows on parts of a tree some months or a year before the rest of the tree; but experimental attempts at cutting out such diseased branches show that the disease has already established itself in the apparently healthy parts of the tree as much as a year before it shows its symptoms. Peaches may premature from the effects of borers or other partial girdling, and perhaps other causes, but in such cases do not show the characteristic spots on the surface.

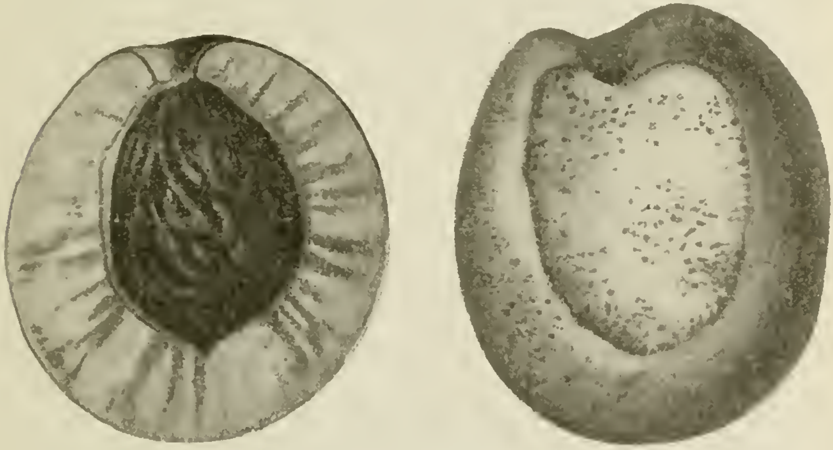


FIG. 88. The entire interior of the peach is affected by the disease. The left-hand peach is cut through the center showing the red lines in the flesh and spots around the pit. The right-hand peach is sectioned through the flesh showing the lines of red in cross-section. (U. S. Dept. of Agriculture.)

The next symptom to appear is the premature development of the leaf buds, which under normal conditions would remain dormant till the next spring. These generally show as slender weak shoots with narrow, yellowish leaves. In young trees or those not in fruit this is the only character that can be used for diagnosing the trouble, and is not perfectly reliable, as such shoots may result from other causes. The yellows shoots have been but rarely found on nursery stock and, as a rule, the disease does not show itself before the third year, and the most common time is after two or three years of bearing. The diseased tree does not seem to be able to produce dormant buds, but the axillary buds keep using up the reserve and developing their sickly growth until sometimes we will have several sets of slender branches where normally there would be a dormant bud only.

The next year there is generally little or no fruit and the upper branches begin to die, while more and more of the clustered, small-leaved shoots come out on the trunk and larger limbs. The leaves are often red and tend to roll at the edges, and the whole tree has a decidedly worthless appearance. Death takes place in three or four years, or before, if the trees are under unfavorable conditions, as the diseased trees are more subject to winter injury than healthy ones. Nitrogenous fertilizers may invigorate the yellows trees and carry them along for a year or so longer, but can not cure them and they simply remain a menace to their fellows, the symptoms of the disease soon reappear, and the tree dies.

When a tree once shows the yellows it is practically worthless to the grower, as the fruit on the affected parts is almost always insipid or bitter, more subject to rot, and a detriment to the market if sold; moreover, no cure has ever been found, another crop can not be expected from the tree, and worst of all is the chance of spreading the disease to the rest of the orchard.

It has been conclusively proven that the yellows can be communicated from one tree to another by buds from diseased trees and by root grafts. It seems that if the smallest piece of living matter from a diseased tree is established on a healthy one, the disease will follow. While the seeds from premature peaches rarely germinate, they do sometimes, and then will produce diseased trees. It is the general opinion that the disease is also spread from tree to tree in the orchard in some other way not yet discovered. This idea is based chiefly on the fact that in orchards where the diseased trees are constantly kept cut out as fast as they appear, there is a much smaller total percentage of trees lost than where they are allowed to stand. Also the disease seems to gradually extend from centers where it first starts.

It will be seen that the nursery is the chief menace. If buds are taken from trees with the yellows, even if they have not yet shown any of the symptoms, the disease will in all probability appear in the trees that grow from such buds. There should be little danger in stock from nurseries outside the yellows territory if it is certain that the budding wood is from nearby trees. Nurseries within the yellows line can only be sure of their buds by getting them from trees outside the yellows districts. Another source of danger from the nursery is in the use of pits for seedlings from districts infected with yellows. The pits so much used from the "natural" trees in the mountain regions of the South, or from the Ozark region and Kansas are by no means free from this danger. The yellows is common on the seedling trees in the southern mountains and at least the rosette is a similar danger in the West.

CAUSE OF THE DISEASE.

The cause of the yellows is yet unknown. A great many theories have been advanced, but most of them have been disproven and the others have not yet been tested. The disease is much like the mosaic disease of many plants, and some others that seem to be due to a disturbance in the enzyme activities of the plant; but that does not explain the cause. The most common opinion now is that it is due to the presence of an organism not yet found or too small to be seen by the microscope.

A great many cures for yellows have been advocated, but even those in which their advocates had unbounded faith, founded on their experience, have failed when tried by others. The prompt removal and destruction of the diseased trees, recommended since 1828, is the best and most practiced method of control in the orchard; but it must be kept up annually and thoroughly. Since the Michigan yellows law was passed in 1875, a number of states have passed yellows control laws, generally with the intent to enforce the destruction of diseased trees in the orchards. Many of these laws are not well enough drawn to accomplish their purpose, and some fail through lack of enforcement. In most peach-growing regions education and sad experience have brought about the general use of these methods in keeping down the disease. The nursery inspection and quarantine laws should be effective in preventing the spread of the disease into new territory. There is no evidence yet, however, that yellows will develop on stock from an infected nursery if planted in the South far beyond the yellows line.

There is a possibility of finding varieties resistant to the yellows, but none have been yet found that are immune. Some varieties develop the disease before others in mixed orchards, and some trees have been known to stand for many years after those around them have perished from the yellows.

A number of other diseases may be confused with the yellows. Of these the prematuring from the work of borers has been mentioned. Another is the little peach which can not be told from yellows in the early stages on nonfruiting stock. The little leaf or California yellows is another. It is distinguished by the dropping of the leaves, the failure of the fruit to develop, and recovery with a better water supply. Severe pruning, girdling, and other injuries will produce shoots like those from yellows, and lack of fertility, borers and many other causes will make yellow foliage. The foliage of trees with the yellows disease is usually yellow, but not always, and there are many more peach trees with yellow foliage that do not have the yellows than that do have it.

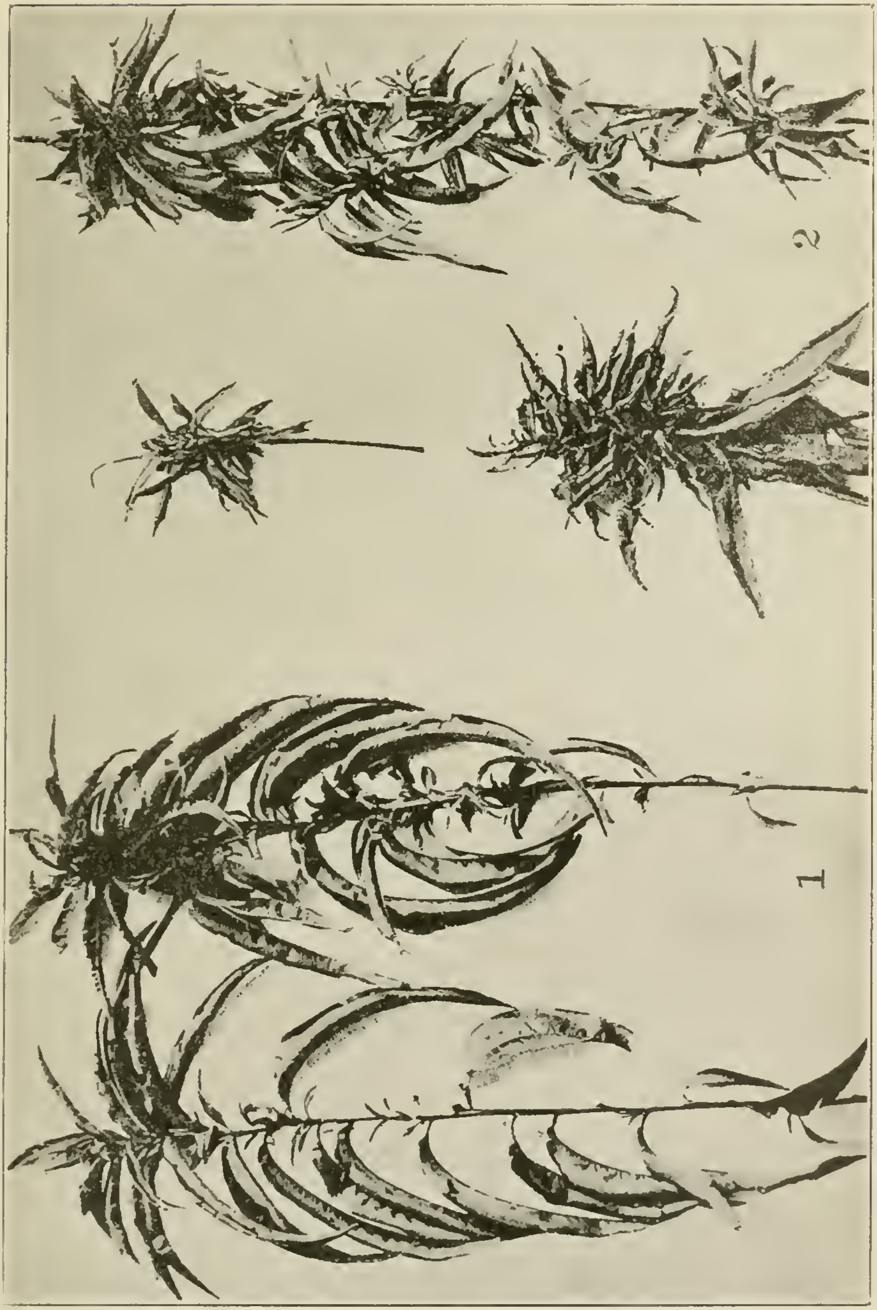


FIG. 89.—Peach rosette: (1) healthy peach twigs; (2) twigs affected with disease, showing the characteristic tufted or rosette growth. (U. S. Dept. Agr.)

PEACH ROSETTE.

The disease most like yellows is the *rosette*. This was first observed in Georgia in 1879 and was at first thought to be a southern form of yellows. It was later found in Kansas and in recent years in South Carolina, Arkansas and elsewhere.

Rosette differs from yellows in having the branches with narrow leaves quite short so as to bring the leaves in bunches or rosettes along the branches and at the ends of the twigs. It acts more quickly, killing the diseased trees in 6 to 24 months. It generally shows first when the buds first open in the spring. When the leaves are older they have a stiff appearance and inrolled margins. The affected foliage turns yellow early in summer and the fruit falls prematurely. There is less tendency to sprouts such as are seen along the trunk and branches in the case of yellows. The cause is not known, but, like yellows, it is contagious and can be spread in the same way. The treatment consequently is similar to yellows. It is recommended to destroy the trees before the leaves fall, as there is indication that they may carry the disease.

CROP REPORT AND STATISTICS

MONTHLY CROP REPORT.

(June 1, 1917.)

By Geo. P. Weldon.

Compiled from reports of the county horticultural commissioners.

County	Almonds (per cent)	Apples (per cent)	Apricots (per cent)	Berries (per cent)	Cherries (per cent)	Figs (per cent)	Grapefruit (per cent)	Lemons (per cent)	Olives (per cent)	Oranges (per cent)	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	40	50	60	100	60	#	#	#	#	#	60	80	80	45	#
Butte	15	20	#	—	85	100	100	#	100	100	25	20	50	60	#
Colusa	100	100	75	#	#	—	#	—	#	—	#	100	100	120	100
Contra Costa	70	90	50	#	60	#	#	#	#	#	100	100	40	90	100
El Dorado	#	90	#	#	—	#	#	#	#	#	85	95	85	#	#
Fresno	#	#	60	100	#	100	#	—	—	—	90	#	#	—	#
Glenn	70	90	50	80	#	#	#	95	100	95	80	75	#	80	#
Humboldt	#	90	#	100	90	#	#	#	#	#	80	90	#	90	#
Imperial	#	#	100	—	#	—	#	#	#	#	#	—	#	#	#
Inyo	#	—	#	—	#	#	#	#	#	#	0	0	#	#	#
Kern	#	100	60	#	#	#	#	#	#	—	60	100	75	100	#
Kings	#	#	60	#	#	#	#	#	#	#	100	#	#	100	#
Lake	65	100	#	#	#	#	#	#	#	#	#	120	#	100	#
Los Angeles	50	100	60	100	#	80	90	85	75	100	100	100	80	#	90
Madera	100	100	50	100	#	—	#	#	100	#	120	#	#	90	#
Marin	#	100	100	90	—	#	#	#	#	#	90	100	95	95	#
Mendocino	#	100	#	#	#	#	#	#	#	#	#	110	#	110	#
Merced	75	#	60	#	#	100	#	#	100	#	100	#	#	#	#
Monterey	60	85	90	70	75	#	#	#	#	#	95	90	70	80	#
Modoc	#	100	#	#	#	#	#	#	#	#	#	#	#	#	#
Napa	40	75	25	—	25	—	—	#	—	#	100	100	70	100	#
Nevada	#	80	0	100	50	#	#	#	#	#	60	100	60	—	#
Orange	#	100	105	100	#	#	100	100	#	100	#	#	#	#	105
Placer	75	70	#	90	70	—	#	#	—	100	70	50	40	#	#
Riverside	25	100	55	#	50	#	100	100	100	100	80	60	#	70	#
Sacramento	45	100	90	110	100	#	—	100	—	—	105	110	90	80	#
San Benito	100	#	100	100	100	#	#	#	#	#	100	100	#	75	#
San Bernardino	#	100	125	100	90	#	100	100	100	100	100	#	#	#	95
San Diego	#	100	10	100	#	#	100	70	—	100	100	#	#	#	#
San Joaquin	100	#	100	#	85	#	#	#	—	#	100	90	100	100	75
San Luis Obispo	60	70	70	#	#	#	#	#	#	#	55	40	#	85	60
Santa Barbara	#	100	100	#	100	#	100	80	100	100	#	#	#	#	110
Santa Clara	#	90	40	100	50	#	#	#	#	#	80	65	—	72	#
Santa Cruz	#	100	85	85	80	#	#	80	#	#	80	90	—	95	#
Shasta	25	60	#	50	#	#	#	#	100	#	60	75	#	80	#
Siskiyou	#	100	#	90	100	#	#	#	#	#	100	100	100	100	#
Solano†	10	#	50	—	60	#	#	#	#	#	50	100	60	75	—
Sonoma	75	75	75	100	50	—	#	#	—	#	100	90	60	65	75
Stanislaus	100	#	90	100	h	50	#	#	#	95	100	75	#	#	#
Sutter	65	90	60	#	100	—	#	#	—	#	80	90	85	90	#
Tehama	50	80	50	20	#	100	#	#	100	100	75	80	100	100	#
Tulare	#	#	35	100	#	—	—	100	—	100	90	—	100	100	#
Ventura	#	#	70	—	#	#	—	100	#	100	#	#	#	#	95
Yolo	40	#	50	—	#	—	#	#	100	#	50	90	75	100	#
Yuba	70	100	#	100	#	100	#	#	100	100	80	110	80	#	#
State average	59	92	65	-----	67	95	-----	91	96	100	86	89	61	77	99

Figures indicate condition of crop in per cent on the basis of 100 as normal.

—Horticultural commissioner has insufficient information for a report.

#Not grown commercially.

†Report by J. W. Mills, farm adviser.

h Crop harvested.

ESTIMATED PER CENT OF THE TOTAL CROP OF THE PRINCIPAL CALIFORNIA FRUITS GROWN IN EACH OF THE MAIN PRODUCING COUNTIES DURING A SEASON OF NORMAL PRODUCTON.

Compiled from reports of the county horticultural commissioners, 1915.

County	Almonds (per cent)	Apples (per cent)	Apricots (per cent)	Cherries (per cent)	Figs (per cent)	Lemons (per cent)	Olives (per cent)	Oranges (per cent)	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	•		14	9						2	•	•	
Butte	12	•		•	3	•	14	•	3	2	•	2	
Colusa	4		•						•	•		•	
Contra Costa	11	•	•	•					•	6	•	•	
El Dorado		•		•					•	3	•		
Fresno			5		53	•	3	•	29			•	
Glenn	•		•								•		
Humboldt		2											
Imperial			•		•								
Inyo		•							•				
Kern		•	•					•	•	•	•	•	
Kings			5						6			•	
Lake	•	•	•						•	8		•	
Los Angeles	2	2	4		•	31	14	26	4	•	3	•	30
Madera	•	•	•		3		2		•			•	
Mendocino		•								•		•	
Merced	•		•		9		•		3				
Modoc													
Monterey	•	12	2	•						•			
Napa	•	•	•	•	•		•		•	4	•	4	
Nevada		3	•	•					•	•	•		
Orange			4			7		10					38
Placer	•	•		3	•		•		6	7	39		
Riverside	3	•	7	•		16	11	14	•	•		•	
Sacramento	6		•	5			5	•	•	18	8	•	
San Benito	•		6	•					•	•	•	3	
San Bernardino		4	4	•		13	7	31	5				2
San Diego	•	•	•			10	5	•	•				
San Joaquin	12		3	25	•		4		3	4	•	•	
San Luis Obispo	•	•	•										
Santa Barbara		•	•	2		•	2						16
Santa Clara	•	•	21	26	•				5	9	18	55	
Santa Cruz		51	3	2					•			•	
Shasta	•	•					•		•	•		•	
Siskiyou		•											
Solano	6		3	10					3	6	16	4	
Sonoma	•	16	•	9	•		5		•	6	•	12	
Stanislaus	6		•	•	6			•	3	•			
Sutter	9				3		•		2	•	•	•	
Tehama	•	•	•		•		11	•	•	2	•	•	
Tulare	•		•		6	5	6	13	9		2	4	
Ventura			6			15		2					20
Yolo	11		5		5		3		2	9	4	2	
Yuba	•				2		3	•	•	•	•		

•Less than 2 per cent of state's normal crop grown in county.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical and other publications of a similar nature.

G. H. Hecke, State Commissioner of Horticulture------------------------------Censor
Geo. P. Weldon, Chief Deputy Commissioner------------------------------Editor

Associate Editors.
H. S. Maddox------------------------Secretary State Commission of Horticulture
Harry S. Smith----------------------------------Superintendent State Insectary
Frederick Maskew--------------------------------Chief Deputy Quarantine Officer
O. W. Newman----------------Assistant Secretary State Commission of Horticulture

Entered as second class matter December 29, 1911, at the post office at Sacramento, California, under the act of June 6, 1900.

Finis rationem excusat.

The staff of the Monthly Bulletin has had to overcome many obstacles during the past year, the greatest one being insufficiency of funds. The shrinking of the state appropriation under the constantly increasing cost made necessary some economic measures that otherwise would not have been contemplated. The Monthly Bulletin has from the beginning of its existence been regarded as a high-class publication, containing the technical and practical in horticulture, and the staff is sincerely desirous of offering useful information to the readers interested in horticultural advancement. The contributions to our pages are voluntary, and we are proud to point to articles by the pens of the best talent that can be secured not only in California, but from all parts of the United States. To improve the quality of the publication the staff will spare no efforts or labor, and in order to obtain the best results we shall always welcome suggestions from any of our numerous readers.

The State Commission of Horticulture has recently published a carefully compiled map showing the areas of the United States under plant quarantine, also the quarantine orders in force, and now for the purpose of supplementing this map we are issuing this special quarantine bulletin, containing articles on plant pests against which we quarantine. You will note they have been written by authorities. The map and this particular issue of the Monthly Bulletin presents condensed and valuable information to the large staff of county horticultural commissioners and their numerous inspectors. We are sure that these two publications will help to make their task easier. Since Governor Stephens has now signed the horticultural bills in which we have all been so much interested, the state commission will issue, at the earliest possible date, a compilation of horticultural acts and quarantine measures to supersede the "Horticultural Statutes with Court Decisions," issued February 1, 1912.

G. H. H.

Standardization of fruit packing under Assembly Bill 212, 1917.

The Ashley fruit standardization bill has been signed by the Governor and, while the provisions will not apply to the early packed fruit this season, they will apply to pears and other fruits that may be packed after August 1.

The experience of California fruit growers, shippers, and packers has been such, under the provisions of the act of 1915, that the sentiment in favor of standardization in general is practically unanimous, and it is only those few who are expecting too much in a short space of time that are disappointed. We can not expect to revolutionize the business of packing fruit in one season or ten seasons, but we can, through a process of gradual evolution, with the aid of good laws, improve from year to year, and it is safe to predict that the already good reputation that California enjoys for her fine fruit will be extended because of her greatly improved pack.

One great weakness in the original standardization law was its exemption from inspection of fruit packed for intrastate shipment. This weakness has been eliminated in the act of 1917, and now every box or package is subject to inspection and must conform to certain standards, whether for intrastate or interstate shipment.

We have been hearing the complaint, for a long time, that the good fruit was all shipped out of the state and our own consumers, as a consequence, were forced to accept a second or third-rate article. We may now hope for a decided change and should be able to buy fruit of the finest grades and packs in the San Francisco, Los Angeles, and other large markets of the state.

Another valuable provision in the new law is found in the requirement that all fruits not packed in standard containers shall be marked "irregular." Thus there can be no encouragement for anyone to pack other than in standard containers for the word "irregular" indicates something below the standard.

The State Horticultural Commissioner and his chief deputy are named as "ex officio inspectors in chief of fresh fruits," whose duties are to settle disputes which may arise between inspectors of two or more counties, regarding the proper regulations for their respective counties. This provision of the law is designed to bring about greater uniformity in the work of the county horticultural commissioners in whose hands the work of inspection is placed. G. P. W.

The Deputy for the South and Citrus Canker.

Our quarantine service has undoubtedly closed the doors tight against the introduction of citrus canker by preventing shipments of nursery stock or fruit from the East by rail or through the Pacific coast ports of entry. There is, however, one possible avenue of entrance into our state, and that is through passenger traffic from the infested regions of our own country. It has not yet been found practicable to inspect the baggage of inward-bound passengers on our passenger trains and there remains this one weak link in our quarantine chain. A prominent citrus grower of the South recently told me it was with difficulty that he resisted the temptation to bring home with him from a trip to Florida some beautiful grapefruit. How much more difficult would it be for one not familiar with the dangers of citrus canker to resist such a temptation.

Our quarantine guardians have frequently caught contraband canker material in shipments from infested districts. It is imperative, therefore, that the danger of a possible infestation be reduced to a minimum. If by any chance an infestation should occur, it should be discovered and checked at once through the patrolling of the citrus regions by a man who is thoroughly familiar with citrus canker. The legislature, at its last session, authorized your commissioner to appoint a deputy for the South. It is the intention of your commissioner to appoint for this work a man of training and experience, the best man to be found, and immediately send him to Florida for the purpose of studying thoroughly citrus canker in all its phases. After thus familiarizing himself with this dangerous disease, his duty will be to patrol the citrus districts of the state in order that any incipient outbreaks may be early detected and means of eradication employed at once. We must keep out this disease at all costs. G. H. H.

THE MEXICAN COTTON BOLL WEEVIL.

By W. D. PIERCE, Entomologist Southern Field Crop Insect Investigations, U. S. Department of Agriculture.

The most destructive pest of cotton is the Mexican cotton boll weevil (*Anthonomus grandis* Boheman), which now extends its depredations on cotton from Costa Rica, through Central America and Mexico into Texas, Oklahoma, Louisiana, Arkansas, Tennessee, Mississippi, Alabama, Florida, Georgia, and to the very border of South Carolina. A native race of the weevil which breeds on a nearly related mallow, *Thurberia thespesioides*, evidently has extended its range northward through the mountain valleys of western Mexico and into the southern part of Arizona. This weevil occurs on its wild host in canyons around Tucson, within a few miles of cultivated cotton, and has demonstrated its ability to attack cotton in that locality. It is therefore only a matter of time until it is established on Arizona cotton. This brings home to California the necessity of extreme watchfulness against the introduction of cotton or Thurberia seed into the Imperial Valley.

The boll weevil lays its eggs singly in the cotton squares, sealing the punctures with a liquid secretion. The location of the puncture is soon marked by a little wart-like prominence. The egg is tiny, white and oval. It rests among the anthers and is easily detected if the bracts and petals are carefully removed. The larva is a white grub, curved like most weevil larvæ, and with a light brown head. It feeds among the stamens until about half an inch long and then makes an oval cell from frass and excretions and pupates. During the midsummer the entire developmental period occupies only about fifteen days, but in cooler weather it is much longer, depending of course upon temperature and humidity variations.

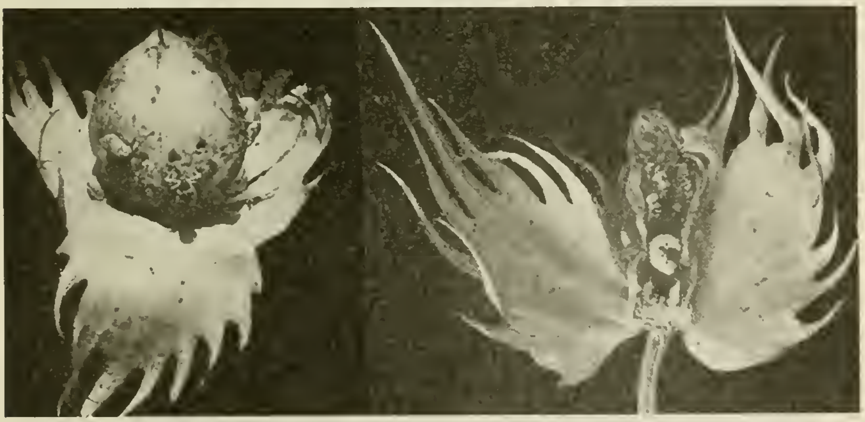


FIG. 90. Cotton boll on left being punctured by weevils. Bloom on the right has been injured by the attack of larvæ. (Original.)

When a cotton square has been injured it usually flares its bracts, thus giving a very good sign of infestation. Most varieties of cotton form a transverse absciss-layer on the petiole of injured squares, which causes them to fall off in a few days. Some varieties, however, have a diagonal absciss-layer which runs down the stem and does not permit the square to completely sever its connection with the plant. The result is that on such varieties the square hangs and dries on the plant. It has been found that these hanging dry squares permit of a much higher percentage of parasitism by Hymenopterous parasites than the fallen squares, due to the sunlight-loving propensity of these parasites.

If the fallen squares lie in the shade of the plant or on moist or rough plowed soil, they offer the best opportunity for the rapid development of the weevil. If, however, the square falls where the heat of the sun will strike it for several hours, death is very likely to occur.

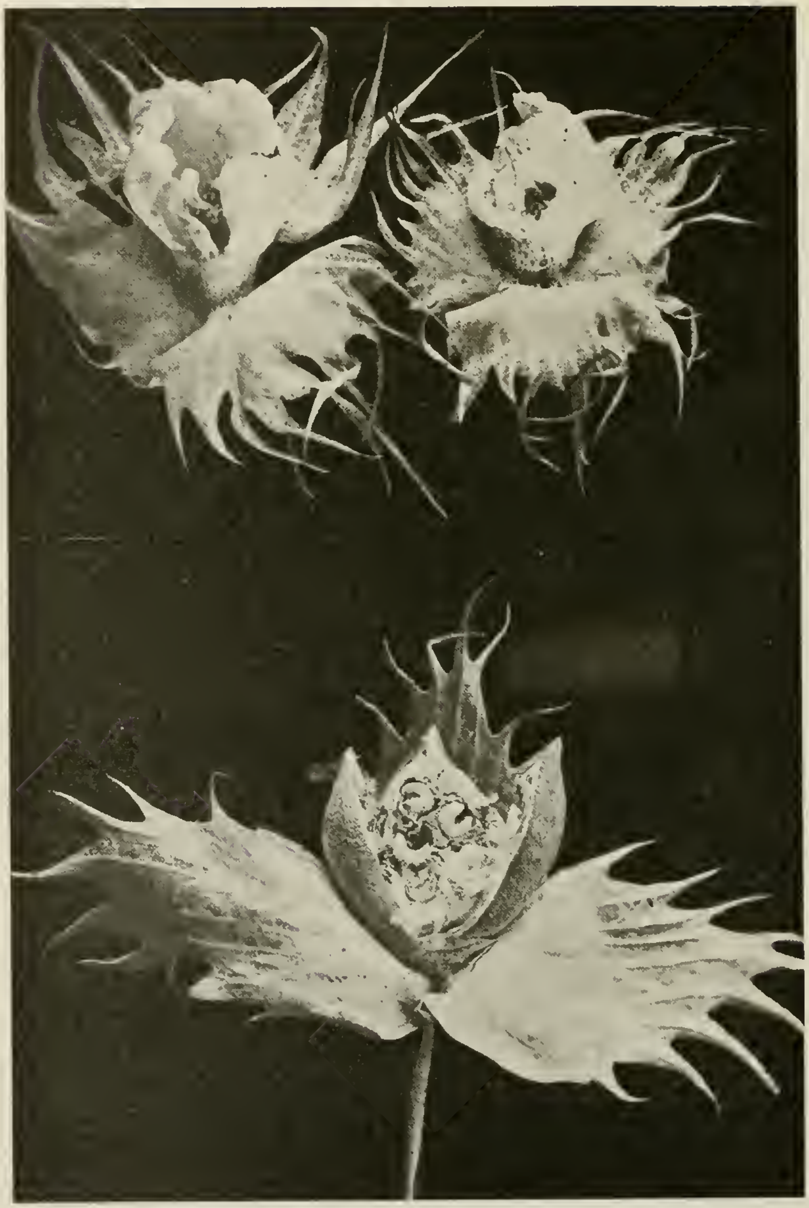


FIG. 91. Upper half—Two poor blooms as a result of feeding punctures. Lower square is broken apart, showing three larvæ of *Anthonomus grandis*. (Original.)

The weevils also deposit their eggs in cotton bolls, even full-grown bolls, but owing to the cooler interior of the boll and the less nutritive substance, development takes place very much more slowly. The hard carpel linings often prevent placing the egg on the surface of the fiber and frequently the larva hatches and never gets into the fiber and seeds. The seed furnishes the principal food for the larva. Often a boll will contain several larvæ, but a single one can ruin one or two locks.

The adults have a habit of dropping when disturbed, and feigning death. They are most active during the daytime. They are strong fliers, capable apparently of long-sustained flight, but usually fly only from plant to plant, or field to field.

In the fall of each year the number of weevils becomes so great that the fields are overstocked. The lack of food causes multitudes to rise in flight and to disperse in all directions. In this way the annual fall dispersion takes place, which has carried the species from 20 to 200 miles a year toward the east, and less rapidly northward. Storms have also been instrumental in spreading them into new territory. The distance of the annual movement depends on the number of weevils seeking food and the amount of food available; hence areas of great abundance of cotton serve to retard spread, and areas of cotton sparsity force extensive spread.

The fall dispersion is checked by killing frosts and the weevils seek the best shelter to be found. Along the Gulf coast the presence of Spanish moss furnishes ideal shelter for multitudes of weevils. Many find satisfactory quarters in the woods, old stumps, fence rows and even underground on cloddy fields. Corn stalks and weeds also provide shelter for many.

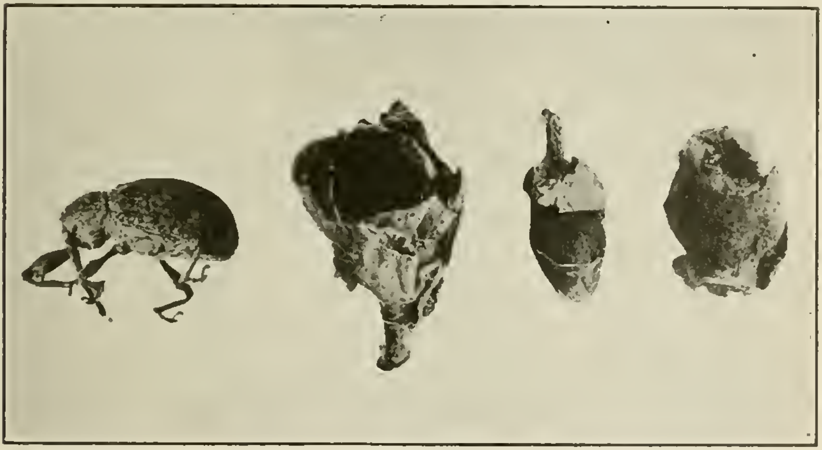


FIG. 92. A Mexican cotton boll weevil (*Anthonomus grandis* Boh.) and the cotton square from which it emerged. (Photo by L. A. Whitney.)

Usually less than 10 per cent of these entering hibernation survive to attack the next year's crop, but with from four to eight generations and an average offspring of 200, of which half are males, the survival of a single fertilized female is sufficient to stock a field.

Fortunately the natural control averages over 50 per cent and often runs above 98 per cent in a given locality, but the annual dispersion usually fills up the weak spots. Extreme cold weather in which a minimum of 10 degrees is reached before the weevils enter hibernation is very fatal. Likewise very hot dry weather is fatal. A combination of these factors caused the weevil to lose for several years the northern part of the black prairie of Texas, but changing climate in subsequent years enabled the species to regain all lost territory. Actual exposure to 10 degrees or 123 degrees for a short time is fatal. The normal soil temperature on a hot summer day is higher than 123 degrees, therefore, if the infested squares fall on heated ground exposed to the sun for several hours the larvæ will die. For this reason the rows should be planted in such a direction as to give the longest period of sun-heat to the middles.

CONTROL.

Many species of parasitic and predatory insects assist in controlling the weevil. The most satisfactory external parasites are *Microbracon mellitor* Say, *Catolaccus incertus* Ashmead, *Catolaccus hunteri* Crawford, *Eurytoma tylodermatis* Ashmead, *Cerambycobius cyaniceps* Ashmead, *Microdontomerus anthonomi* Crawford, and *Triaspis curculionis* Fitch. The Dipterous *Eulocwia globosa* Townsend is a good internal parasite of the larvæ in moist sections, but would be of no value in dry regions.

Small biting ants of the genera *Solenopsis*, *Pheidole* and *Monomorium* are excellent weevil enemies, as they will eat into the squares and attack the larvæ. Many predatory insects are known to feed on the adults, but they are not of any particular value.

Many birds are of considerable value as weevil destroyers.

The repression measures used against the weevil comprise a series of methods known as the cultural system of weevil control. Briefly this system consists of seed selection, selection of varieties which yield best under weevil conditions, early planting, intensive cultivation, square picking only when labor is cheap and not needed for other important farm operations, early harvesting, fall destruction, fall plowing, rotation of crops. Everything in this system is aimed at the rapid maturing of crops ahead of weevil damage and obtaining the greatest mortality by heat control in summer and starvation in the fall.

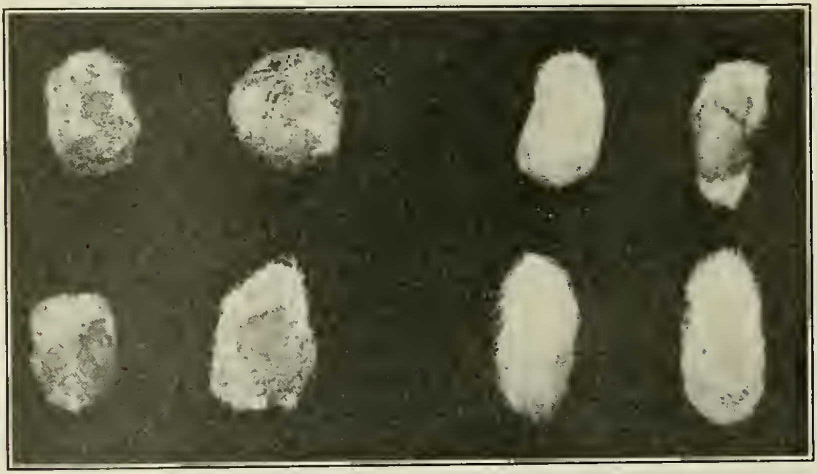


FIG. 93.—Relation of cotton boll cells to seed. The four cells on the left are inhabited by the pupa of the cotton boll weevil. On the right are four normal seeds of the cotton plant. (Original.)

The varieties chosen for weevil territory depend largely upon the local conditions. Each section must decide for itself what varieties give best results. The best results in various parts of the South have been made with King, Simpkins, Triumph, Cleveland Big Boll, Toole, and Cook's Improved. Several wilt resistant types developed in Georgia appear to show favorable results.

In selection it is necessary to choose rapid maturing varieties, preferably wilt resistant, with large bolls, or a tendency to produce many bolls, short internodes, light foliage, and determinate growth.

Early planting and intensive cultivation are aimed at rushing the crop to maturity ahead of the weevil multiplication. The cultivation should be of such a sort as to obtain a pulverized, easily heated soil.

Square picking usually comes at a time when the labor is urgently needed for other farm operations and is therefore inexpedient except when there is an abundance of cheap labor.

In the fall the crop should be picked as soon as possible. The growth of the cotton should be stopped as soon as the crop is made and the plants destroyed by plowing under, burning or grazing, as long before killing frosts are expected as can possibly be done. This is to deprive the weevils of food at a time when they need it and hence lower the possibilities of successful hibernation.

QUARANTINE.

In addition to the repression measures, there are the prevention measures of quarantine, which latter most concern California at present. In spite of the rapid movement of the weevil by natural methods, it is indisputable that the species would have been far more widely distributed had it not been restricted to natural spread by quarantine methods. The quarantines in effect in the majority of the Southern States forbid the shipment of cotton seed or seed cotton, cotton seed sacks, cotton pickers sacks, cotton seed hulls, Spanish moss and furniture packed in any of the above articles from infested territory to noninfested territory. It is also inadvisable to move freight cars which have carried such articles from infested territory to noninfested territory, until they have been thoroughly cleaned. Seed may be shipped if a certificate accompanies, stating that a competent entomologist has fumigated with carbon bisulphide.

The special regulations of the state of California cover only the shipment of cotton seed from infested territory and the cleaning of cars which have contained seed or lint. As far as these provisions go they appear very good, but it is the opinion of the writer that provisions covering the other commodities mentioned above should be included, and that furthermore there should be a restriction of the shipment of Thurberia (wild cotton) seed and bolls from anywhere. This plant is regarded as a pretty garden plant and might be thus introduced

THE ALFALFA WEEVIL.

By Harry S. Smith.

Alfalfa is California's most valuable forage crop. It is the backbone of the live stock industry of the state, and its protection from destructive pests is therefore of prime importance.

The alfalfa weevil (*Phytonomus posticus* Gyll.) is the most destructive pest of alfalfa occurring in the United States, and against it California maintains a strict quarantine. This insect occurs at the present time in Utah, the southeastern corner of Idaho and the southwestern corner of Wyoming. It was introduced in some unknown way from the Old World, where it is found throughout the Mediterranean region. It was first discovered in this country near Salt Lake City, Utah, about thirteen years ago, where it covered only a few acres of territory. Since then it has spread with considerable rapidity, although it has not made any extended jumps in its distribution.

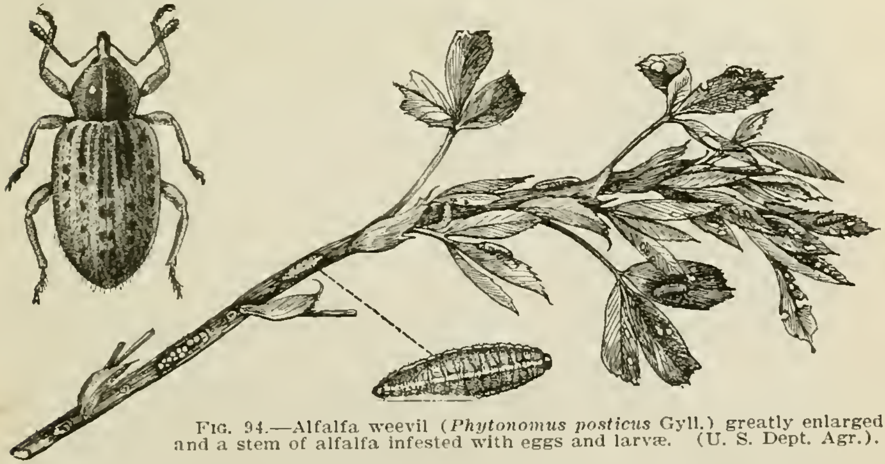


Fig. 94.—Alfalfa weevil (*Phytonomus posticus* Gyll.) greatly enlarged and a stem of alfalfa infested with eggs and larvæ. (U. S. Dept. Agr.).

The adult insect is one of the snout beetles, or *Rhyncophora* belonging to the same family with the apple curculio and plum curculio of the Eastern States. It is about three-sixteenths of an inch in length, grayish brown in color, and possesses a comparatively long snout. The adult alfalfa weevils pass the winter on the ground in rubbish and in crevices in the soil. In the spring when the alfalfa begins to grow, they come out of their hiding places and begin feeding upon the tender alfalfa shoots. Feeding takes place through the long snout, with which it punctures the alfalfa stems for the purpose of sucking out the plant juice. After feeding for several days or weeks during the early spring, egg-laying begins. The adult female accomplishes this by boring a hole into the alfalfa stem with her snout, after which she turns and deposits the eggs into this cavity. The eggs are very tiny, golden yellow in color and oval in shape. They are laid in clusters, five to forty in a mass.

The eggs hatch in a few days, the incubation period depending of course upon conditions of temperature and humidity. The newly-hatched larva is pale green, almost yellow in color, with a black head. It soon leaves the egg cavity in the alfalfa stem and crawls up to the tender growth at the top of the plant, where it can feed in hiding. In a few days the first molt takes place, the larva now becoming a darker green in color and of course larger in size. In the succeeding molts it gradually increases in size and feeding capacity, and a faint pale stripe appears running down the middle of the back. After feeding for a month or so it becomes full grown, increasing about a quarter of an inch in length. The larva feeds almost entirely on the tender portions of the host plant, in this way preventing it from making any appreciable growth. When the larva or grub has become full-fed, pupation takes place. This generally occurs at the base of the plant in the old stems and rubbish usually found there, although it frequently pupates within a curled leaf. The pupa is contained in an extremely delicate, lacy white cocoon, through which the contents may easily be discerned. It is pale green in color, gradually becoming darker until just before it changes into the adult beetle, when it takes on a brownish tinge.

The greatest damage resulting from the presence of this insect occurs in the first and second crops. The first crop usually succeeds in making a start in the spring, before the young larvæ are abundant. However, the alfalfa stems are soon filled with eggs and the larvæ hatching from these eggs before the crop is cut, sometimes cause a total loss. The second crop will usually be a total loss if nothing is done, since the abundant larvæ found on the first crop at the time of cutting fall to the ground and overwhelm the new shoots of the second crop so that it is entirely prevented from growing, and the field remains as barren as though the alfalfa had been suddenly killed. The damage in the infested districts has been estimated at 50 per cent of the entire second crop, where remedial measures are not undertaken.

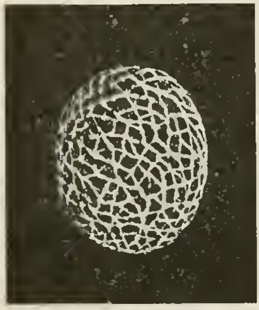


FIG. 95.—Alfalfa weevil cocoon, much enlarged. During this stage the presence of the weevils is comparatively easy to detect. The cocoons are pure white and are usually found in the curl of a leaf, at the base of the stem or in other protected places. (U. S. Dept. Agr.)

CONTROL MEASURES.

For the control of the alfalfa weevil a number of different methods have been devised by the U. S. Department of Agriculture and the Utah Experiment Station. Since the adult weevils spend the winter on the ground and in the crevices in the soil, a large number may be destroyed by flooding the fields during late winter and early spring with muddy water. This method, however, is applicable only under special conditions of water supply and soil. The thorough cultivation of the alfalfa fields in the spring by means of discs, spring-tooth harrows or other special machinery is of great value in stimulating the growth of the crop and keeping it well ahead of the feeding weevil larvæ. In many cases this cultivation was found by the Department of Agriculture to increase the first crop fully 50 per cent. Spraying the fields when the plants are small with a stomach poison, such as arsenite of zinc, will destroy large numbers of the weevils before they lay their eggs in the spring. When properly done there is no danger to live stock in using this method. Pasturing the fields with live stock is useful in early spring, since the animals eat the stems containing the weevil eggs. The Department of Agriculture is authority for the statement that where pasturing is practicable it will solve the alfalfa weevil problem. Soiling the crop gives the same result as pasturing if the crop is cut before the eggs hatch to any great extent.

Owing to the fact that the alfalfa weevil is an introduced pest, it is remarkably free from attack by natural enemies, although an occasional case of attack by native species has been recorded. A fungous disease destroys the weevil to a slight extent in Utah. One parasite from Italy, which the writer was able to ship to Utah when studying the alfalfa weevil in Europe for the U. S. Bureau of Entomology in 1912, has become established and seems to be doing good work. Mr. Reeves, in charge of the weevil investigations, has the following to say regarding this parasite:

"As high as 30 per cent of the larvæ present in midsummer were found to be parasitized, and it is possible to collect parasite cocoons for wider distribution without difficulty. Outside of the artificial colonies the parasite has spread spontaneously almost as widely, and it now occurs in this way throughout the Weber Valley, which is approximately parallel to Salt Lake Valley and from ten to thirty miles distant from it. It is still too early to say how valuable the parasites will be as a means of control, but a certain amount of usefulness is demonstrated beyond doubt, and there are great possibilities."

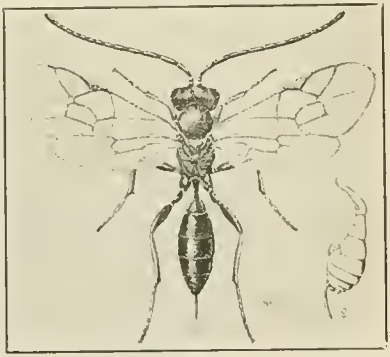


FIG. 96.—*Bathyplectes* sp., a parasite of the alfalfa weevil. Adult female; lateral view of abdomen of same below, at right. Enlarged. (U. S. Dept. Agr.)

QUARANTINES.

The California State Commission of Horticulture early appreciated the dangerous nature of this pest which threatened her fifty-million-dollar crop of alfalfa, and quarantine measures were taken to prevent its introduction. A quarantine order was issued in 1912 against the pest, and this order has since been improved by amendments. Arizona, California, Idaho and Montana maintain quarantine regulations against the alfalfa weevil, Idaho quarantining two of her own counties. Quarantine regulations of the several states present considerable variation due to the difference in opinion of the various quarantine officers. A conference was held last summer, however, at which representatives of seven Western States were in attendance, and as a result of this meeting more uniform action has been and will be taken. It seems, to those who have given the subject close study, that the absolute quarantining of hay and straw, with restrictive measures against potatoes in sacks, emigrant movables, live stock in cars, and nursery stock, would close the most important avenues of entrance. The quarantining of alfalfa seed and bees in hives is considered unjustifiable.

While the alfalfa weevil is certainly a pest to be feared, we in California may take some comfort in the fact that during the thirteen years the pest has existed in America not a single long jump has occurred in its distribution. Even in the infested states it has not traveled more rapidly along the railroads than elsewhere, although the adult beetles have been taken countless times from Pullman and freight cars. Still we must bear in mind that it succeeded some way in making the jump from Europe to Utah and it certainly might more easily make its way into California from the infested states. We have considered, from the fact that trains run directly from the infested regions to alfalfa fields in southern California via the Salt Lake Route, that it would be more likely to gain a foothold there than elsewhere, but though the commission has had those fields inspected annually by men who know the weevil when they see it, no trace of it has as yet been discovered. With the efficient quarantine methods of the Commission of Horticulture, it is not too much to hope that our state can be kept indefinitely free from this pest.

WHITEFLIES OF CITRUS.

By E. W. Berger, Entomologist, State Plant Board, Gainesville, Florida.

It is intended in this paper to give brief accounts of the injuriousness, life history, and control measures of the common whitefly as it pertains to Florida. Reference in these accounts will also be made here and there to the cloudy-winged whitefly and the woolly whitefly, which, with the common whitefly first in the list, are the three principal whitefly pests of citrus in Florida.

Following these accounts will be added the list of 16 whiteflies at present known to infest citrus in a greater or less degree in different parts of the world, giving in each instance the origin, or probable origin, or distribution, food plants, and degree of injuriousness. Of this list, nine are present in the United States, four having been introduced and five being native. It is unnecessary to state that the introduced species are the pests, while the native ones rarely occur in any abundance on citrus. Of the 16, seven do not occur in the United States.

WHAT ARE WHITEFLIES?

Whiteflies (Figs. 97 and 98) are small, four-winged insects, measuring about one-thirty-second to one-sixteenth inch in length. They belong in the same group, or order, of insects with scales, plant lice, leaf-hoppers, cicadas, etc. These insects are generally white, as the name implies, but some have dark markings on the wings. In at least one instance the wings are of a slate color. The bodies vary in color from light yellow to brown or dark. The color of the immature stages, larvæ and pupæ, also vary from light yellowish to black, so that one might truly speak of black whiteflies.

Like the order of insects to which they belong, whiteflies have sucking beaks in all stages, by means of which they penetrate the leaves of their host plants and extract large quantities of sap for food.

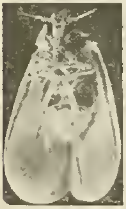


Fig. 97.—Cloudy-winged whitefly. Enlarged about 16 times. (Courtesy Fla. Exp. Station, Bul. 103. Photo by E. W. B.)

INJURY.

The common whitefly has been the principal citrus pest in Florida and the Gulf Coast States since about 1880. Its injury is due, in the first place, to the extraction of large quantities of sap from the leaves. In the second place, large quantities of the sooty mold, a black fungus that develops in the honey-dew excreted by the insects, may so completely cover the leaves and fruit as to interfere with the proper physiological activities of the trees. Badly-infested trees get out of condition and produce small crops of insipid fruit. Fruit covered with sooty mold will also be retarded in ripening and belated in coloring, especially the upper part, which may remain green, when the rest of it has assumed the color of ripe fruit. A secondary injury to the trees may result from an excessive increase of the common scales of citrus, which find protection under the sooty mold that covers leaves and branches. Fortunately, the vigilant growers of Florida have learned how to largely obviate these injurious effects.

What has just been stated for the common whitefly, holds true in about an equal degree for the cloudy-winged whitefly and the woolly whitefly. The second named is not regarded as quite so serious a pest as the common whitefly, while the latter appears to offer better protection for scale insects.

LIFE HISTORY.

The life history of the common whitefly consists, briefly, of egg, first stage larva, second stage larva, third stage larva, fourth stage larva, pupa, and adult or winged insect. All stages live on the under sides of the leaves and the adults swarm freely from dusk until after daylight.

The eggs are minute, light colored when fresh and barely visible to the unaided eye (Figs. 98 and 99). They are deposited in enormous numbers, as many as 20,000 having been estimated on a single citrus leaf. The surface is highly polished and they are attached to the leaf by means of a short stalk. They hatch in eight to twenty-four days, according to the temperature.

The eggs of the cloudy-winged whitefly (Fig. 99) are covered with a reticulation as though they were surrounded with a delicate net, which is easily brushed off.

They are light at first, but soon turn dark. The eggs of the woolly whitefly are without reticulations, dark brown, and generally arranged in circles (see Figs. 103 and 104).

The first stage larvæ are not much larger than the eggs, have six legs, and move about freely for a few hours, or until they insert their beaks and remain stationary. The change from stage to stage consists in growth and a shedding of each larval skin until the fourth stage is reached. The fourth stage larva (Fig. 105) changes to the pupa by a gradual development until the adult whitefly is visible inside the larval skin.

The adult emerges through a T-shaped slit and after about six hours may begin to deposit eggs to the number of 250.

The larvæ and pupæ of the common whitefly are light greenish with but three marginal filaments of waxy secretion in the pupal stage. A brick-red spot is visible in the back of the pupa. This is the same for the cloudy-winged whitefly, except that the latter does not have the brick-red spot. The larvæ of the woolly whitefly are, after the first stage, dark or almost black, and develop a waxy fringe in the second stage (Fig. 103), and the woolly secretion, from which the insect received its name, in the third stage. The pupa is also covered with the woolly secretion.

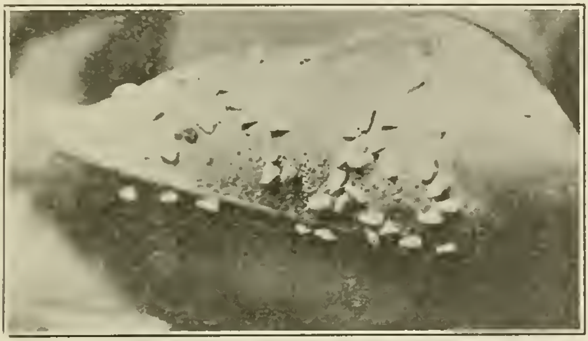


FIG. 98.—Eggs and adults of common whitefly on citrus leaf. Enlarged about 2⅗ times. (Courtesy Florida Experiment Station, Bul. 67.)

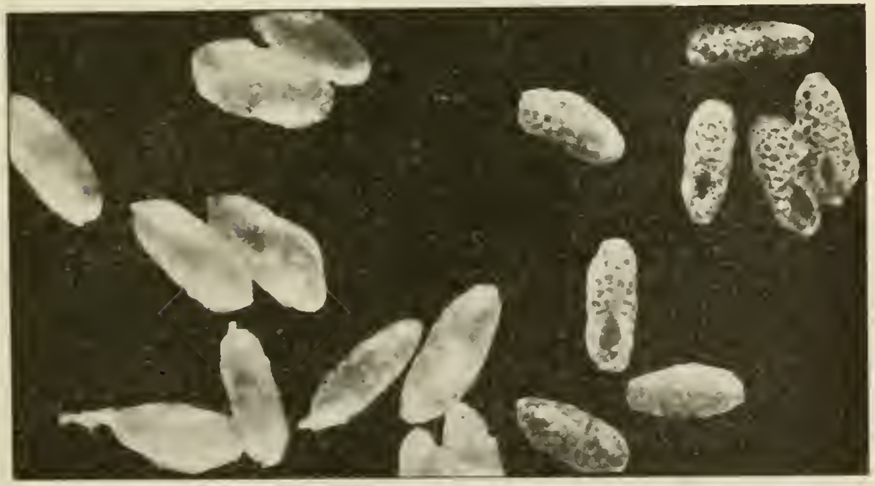


FIG. 99.—Eggs of common whitefly on the left. Smooth surface. Enlarged about 80 times. Eggs and eggshells of cloudy-winged whitefly, on the right. Netted surface and wide openings. Enlarged about 80 times. (Courtesy Florida Experiment Station, Bul. 97.)

BROODS.

There are three regular, well-defined broods of the common whitefly, with sometimes a partial fourth brood in winter. The first brood of adults generally emerges during March, the second during June, and the third during August and September. The second and third merge more or less into one, there being some adult whiteflies out during what is regarded the interval in July between the second and third broods. An understanding of the time and occurrence of the broods of adults is important for a proper understanding of the control measures, especially for spraying with insecticides.

The relative occurrence of the broods of the common whitefly, the cloudy-winged whitefly, and the woolly whitefly are shown in the following diagram (Fig. 100):

CONTROL MEASURES.

Control measures for the common whitefly consist either in the use of the several fungus parasites that generally infect it in Florida, or in spraying with emulsions of oils and soaps.

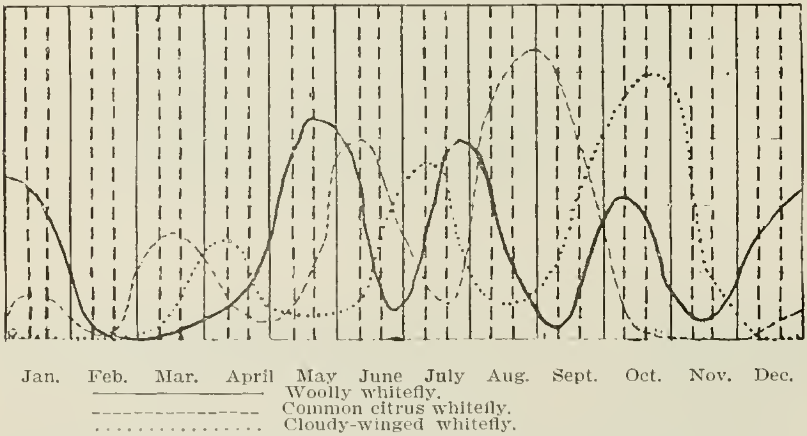


Fig. 100.—Diagram showing relative date of emergence of adults.
(Courtesy Fla. Exp. Station, Bul. 126.)

FUNGUS PARASITES.

There are three principal fungus parasites of the common whitefly. These are the red aschersonia (Figs. 101 and 102), the brown fungus and the white fringe fungus. These are so effective that a grower may count on a clean crop of fruit, free from sooty mold, about every third year, with only partial control during the other years. While this extent of control does not satisfy all the most fastidious growers, many depend wholly upon the fungi and apply no other remedies.

The fungi were originally spread artificially by planting a few trees, having a fungus upon them, in a grove into which it was intended to introduce it. Later, leaves with fungus were pinned onto the leaves of trees infested with whitefly, and finally, mixtures of fungus spores and water, made by mixing leaves having fungus upon them, were sprayed into whitefly-infested trees. The last method is the one now generally employed. While fungus obtained from leaves is still used, this practice is being discouraged since the advent of citrus canker, and the use of pure cultures recommended. When fungus obtained from leaves was used, 30 to 40 fungus spots per pint of water gave good results.

As indicated in the preceding paragraph, the use of pure cultures of fungus is recommended, as that obviates the risk of getting canker or other diseases with the fungus material. While it is true that the danger of getting canker with fungus material on leaves is remote, since all canker-infected properties are under quarantine, including a radius of a mile, there is still a possibility of getting leaves from a locality having canker, not yet discovered. The risk of getting other diseases is, however, a factor to be considered. Therefore, when the entomological department of the Plant Board began, about a year ago, to grow the red aschersonia, or red whitefly fungus, in pure culture, growers at once became interested, and may in the near future refuse to use anything but the pure cultures. While last year, somewhat less than 400 cultures were produced and sold, the 1917 crop consists of approximately 2,000 cultures. Each culture (Fig. 102) consists of the fungus and spores produced on four or five plugs of sweet potato, about the size of a finger, with some agar (seaweed jelly) all sterilized together in a pint wide-mouth bottle, in a steam sterilizer prior to inoculating (planting) the fungus on it. One of these cultures when mixed with 50 gallons of water is sufficient to treat, or spray, about an acre of grove. The charge made is 50 cents per culture, plus transportation. The best time to introduce or spread fungus is during the period of summer rains, hot weather and plenty of moisture being necessary for the fungus to thrive.

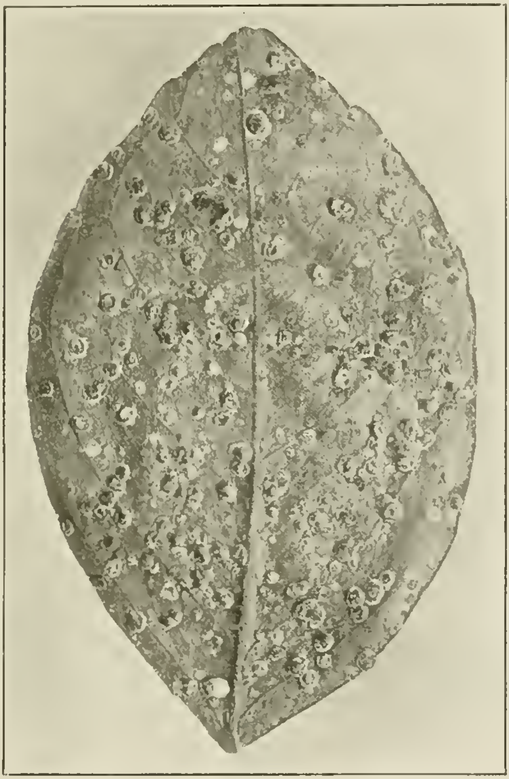


FIG. 101.—Red Aschersonia, or red whitefly fungus. Natural size. (Courtesy Fla. Exp. Station, Bul. 97.)

The red aschersonia, the brown fungus and the white fringe fungus, have been found very effective at times against both the common whitefly and the cloudy-winged whitefly. They appear not to be much of a factor in the control of the woolly whitefly. The red aschersonia has, on the other hand, been several times found effectively controlling at least two other species: the inconspicuous whitefly on sweet potatoes and an unidentified one with black larvæ and pupæ received on custard apple.

There is another effective fungus that infects only the cloudy-winged whitefly, namely, the yellow aschersonia. This is similar to the red aschersonia, except that it is yellow.

So far only the red aschersonia has been grown in pure culture for distribution. To grow the yellow one would be unnecessary, since the red one can be used instead of it on the cloudy-winged whitefly.

The brown fungus has so far not fruited in pure cultures, and has not been grown. The white fringe fungus could be produced in pure cultures, but the need for doing this has not arisen.

SPRAYING WITH INSECTICIDES.

It is not generally understood that whiteflies can be almost perfectly controlled by spraying with emulsions of oils or even solutions of soap. In order to successfully control whiteflies by spraying, some knowledge of the life history and the succession of broods is absolutely necessary. Even as late as 1906 extensive spraying, that proved to be practically useless, was carried on in Florida. In order to spray successfully against whitefly it must be done at a time when there are but few, if any, adult whiteflies present. While it is easy to kill the adults that are hit by the spray, so many escape by flying away that practical results are not obtained. The eggs, on the other hand, are also not extensively destroyed by sprays. The ideal time, therefore, theoretically considered, in which to spray for whitefly is soon after the adults have quit swarming and the eggs have hatched. In practice, this works out just as indicated in the theoretical conclusions. The directions given are to begin spraying ten days or two weeks after the whitefly has quit flying, or swarming. The ten days or two weeks allow time for most of the eggs to hatch, and the young, or larvæ, are then also in the younger stages, when they are easier killed. When spraying as just indicated, the grower has three opportunities per year in which to effectively reduce his whitefly to the extent of 90 to 99 per cent, namely, the latter part of April and early May, during July, and again beginning with October or the latter part of September. These dates are, however, not absolute, but will vary somewhat with climatic conditions. Neither is July a good time to spray on account of the summer

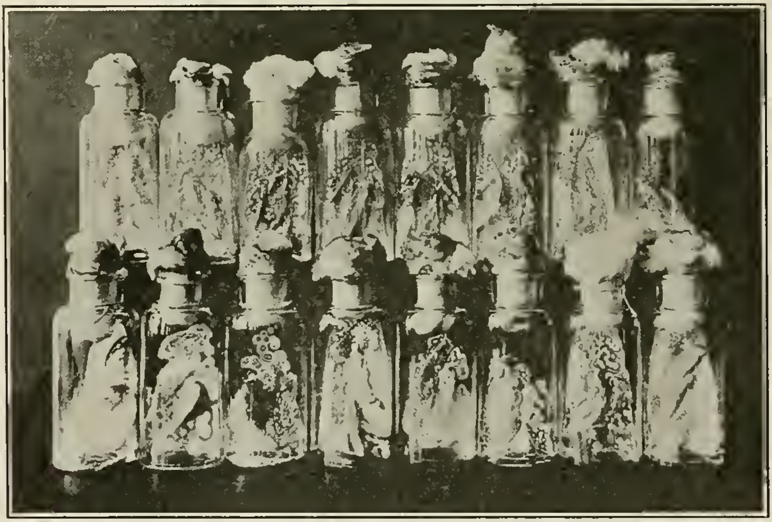


FIG. 102.—Group of pure cultures of the red aschersonia, or red whitefly fungus. Cultures are grown on sterilized sweet potato and agar in wide-mouthed pint bottles stoppered with plugs of cotton batting. (Original.)

rains, and it is considered best to introduce some of the fungi at that time. The best time of all is the fall period, beginning in September or October, since the trees, if thoroughly sprayed then, will remain free through the rest of the fall and winter. In fact, the fall spraying will generally be found sufficient, especially if one or all of the fungi have been present during the summer, and provided there are no untreated groves near-by from which the whitefly can spread. Spraying may, and frequently is, carried on all winter, but it is best to spray early in fall and rid the trees of the insects for a longer period, there being no regular winter brood.

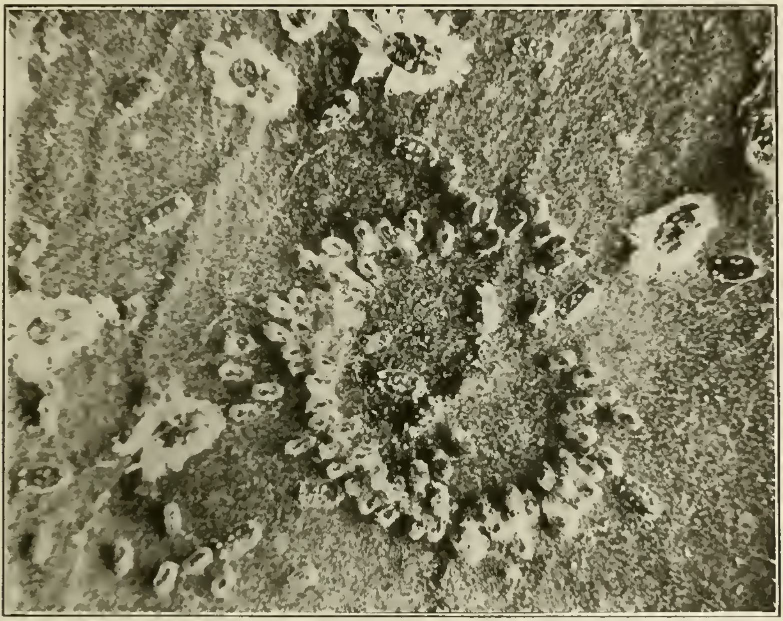


Fig. 103.—Eggshells, first and second stage larvæ, of woolly whitefly. Note openings from which the young escape. White dots on first stage larvæ are spines. Highly magnified. (Courtesy Florida Experiment Station, Bul. 126.)

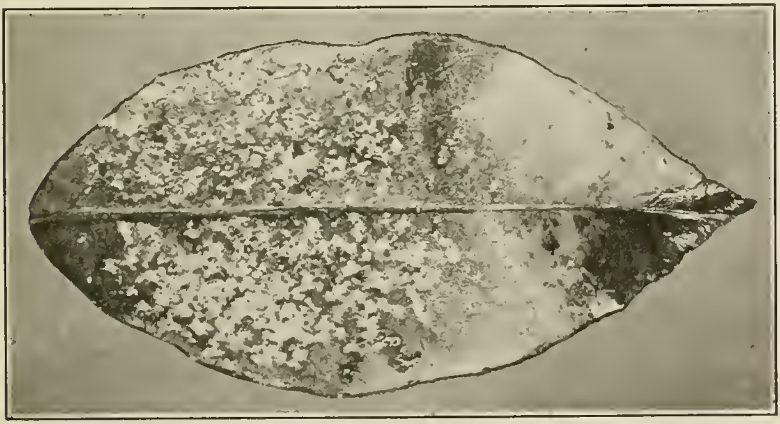


Fig. 104.—Woolly whitefly on citrus leaf. Slightly smaller than natural size. Note the circles of eggs. (Courtesy Florida Exp. Station, Bul. 126.)

What has been stated about spraying the common whitefly applies quite the same for the cloudy-winged species, although the latter is a few weeks later in its development. This rule for spraying applies equally well for the woolly whitefly, but, as can be seen from the diagram (Fig. 100), the time for spraying does not coincide so well with that of the other whiteflies.

The oil emulsions used are made from paraffine oils testing 24–28 degrees Baumé. Soap is the emulsifying agent, and the dilution used in spraying the trees is 1 per cent oil in winter, to as low as ½ per cent in spring or summer. Several commercial brands of oil emulsions, or miscible oils, are also used effectively. Fish-oil soap, or other soaps, 1 pound to 5 or 6 gallons of water, are excellent when applied at the right time, *i. e.*, before the larvæ reach the advanced fourth stage and pupal stage.

FUMIGATION.

The practice of fumigating for insects has not become established in Florida, although at least two apparently successful attempts to introduce it have been made. The inherent difficulties are: the shortness of the season (December, January and February) during which fumigation can be conducted; night work; heavy dews and winds; greater skill required; greater overhead expense, etc.

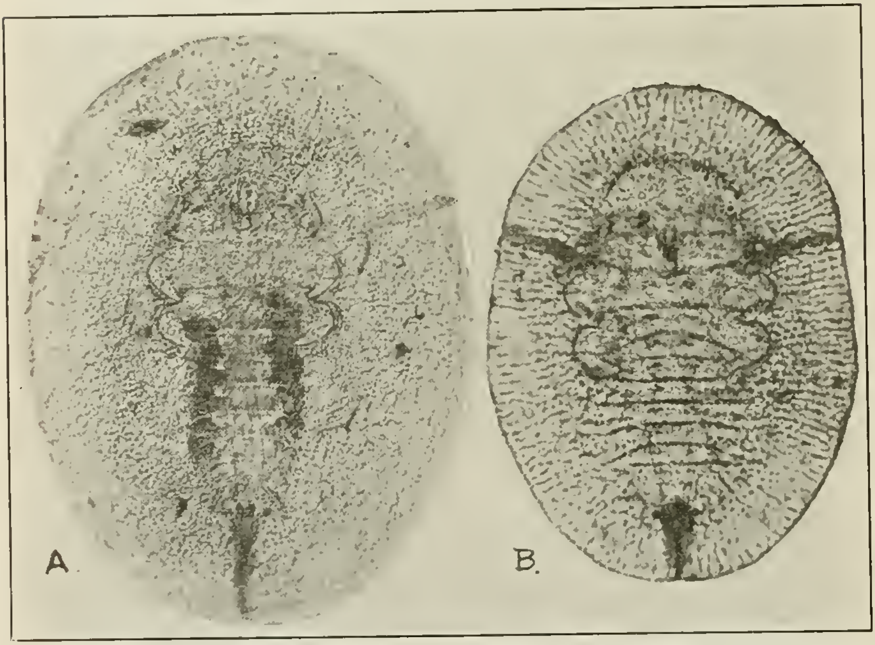


FIG. 105. A. Fourth stage larva of the cloudy-winged whitefly, photographed by transmitted light. Enlarged about 45 times. B. Fourth stage larva of the common whitefly, photographed by transmitted light. Enlarged about 45 times. (Courtesy Fla. Exp. Station, Bul. 97.)

LIST OF CITRUS WHITEFLIES.[1]

Introduced Species.

1. Common whitefly, *Dialeurodes citri* (Ashmead). Formerly *Aleyrodes citri.* Introduced from Orient, probably India. Found in India, Ceylon, Japan, China and United States. Kirkaldy, according to Quaintance and Baker (reference in footnote), reports it as present in Mexico, Chile and Brazil. In the United States it is widely present in the Gulf States, Georgia, South Carolina, and farther north on chinaberry, cape jasmine and privet. It was discovered in 1907 at Marysville, Sacramento and Oroville, California, but is said to have been eradicated, except at Marysville, where

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[1] In the preparation of this list free use has been made of the paper by A. L. Quaintance and A. C. Baker, *Jrnl. Agric. Research,* Wash., D. C., Vol. VI, No. 12, June 19, 1916, U. S. D. A.

it still occurs in small numbers, and where it is being kept under control. It is generally present in Florida, but there are extensive citrus areas still free from it. A serious pest, but controllable.

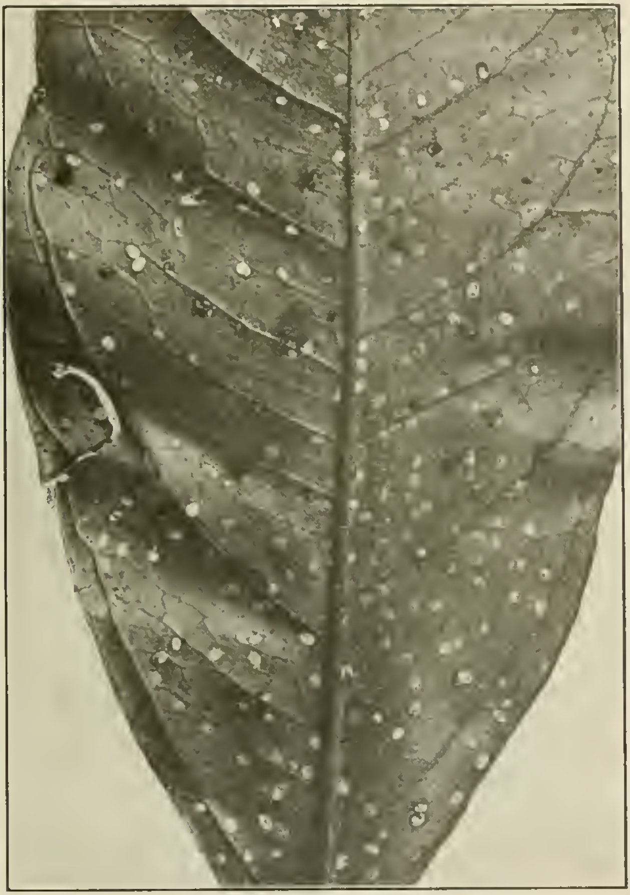

FIG. 106.—The common whitefly (*Dialeurodes citri* Ash.) on lemon leaf taken at Marysville, Cal. (Photo by Weldon.)

FOOD PLANTS ON WHICH D. CITRI HAS MATURED, LISTED IN ORDER PREFERRED.[2]

Severely Infested.

Chinaberry and umbrella trees
Citrus, all varieties and species
Cape jasmine
California privet
Prickly ash
Japanese and native persimmons

Less Severely or but Little Infested.

Cherry laurel
Coffee
Pomegranate
Wild olive (*Osmanthus americanus*)
Green ash
Button bush (*Cephalanthus occidentalis*)
Smilax sp.
Camellia japonica
Privets (*L. amurense* and *L. lucidum*)
Jasminum sp.
Viburnum nudum
English ivy
Water oak
Trumpet flower (*Tecoma radicans*)
Ficus sp.
Scrub palmetto
Honeysuckle
Blackberry
Oleander
Boston ivy
Mexican orange (*Choisya ternata*)
Osage orange (*Maclura aurantiaca*)
Portugal cherry (*Cerasus* sp.)
Tree-of-heaven (*Ailanthus*)

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[2] List, slightly modified, from Bul. 123, 1914, Fla. Exp. Station, by J. R. Watson.

2. Cloudy-winged whitefly, *Dialeurodes citrifolii* (Morgan). Formerly *Aleyrodes nubifera* Berger. Regarded as being of Oriental origin. Occurs in Cuba and Mexico. Known from North Carolina (1889), Florida (1895), Mississippi (1889), Louisiana (1890), California (1907), and Texas. The writer found it in Brownsville, Texas, in 1914. The California infestation was at Bakersfield and is said to have been eradicated. In Florida it is largely confined to a belt surrounding Tampa Bay, which belt extends northeastward to the Atlantic Ocean, and then southward in a narrower belt along the east coast, including north Dade County. It also occurs at Key West. It has been found to infest only citrus, and *Ficus nitida* at Audubon Park, New Orleans, La. An important pest, but not considered as noxious as the common whitefly.

3. Woolly whitefly, *Aleurothrixus howardi* (Quaintance). Formerly *Aleyrodes howardi*. Probably of West Indian, Mexican or South American origin. It occurs in Cuba, Isle of Pines, Porto Rico, Jamaica, other West Indies, Mexico, British Guiana, Brazil, Argentina, Canal Zone, Chile and Paraguay. Apparently first found in Florida in 1890, on the sea-grape, at Miami, by Prof. P. H. Rolfs, but it has never infested citrus at that place.[3] It was first observed on citrus in Florida at Tampa, by Dr. E. A. Back, in 1909. Since then it has spread rapidly to many parts of the state. It has apparently the same food plants as *A. floccosus* (see next paragraph). It is a serious pest, and were it not for a minute hymenopterous parasite, *Eretmocerus haldemani*, which brings it under control during the summer and fall, it would be difficult to control.

4. *Aleurothrixus floccosus* (Maskell). Probably of West Indian, Mexican, or South American origin. Found on citrus, sea-grape (*Coccoloba uvifera*), *Plumeria* sp., *Baccharis genistelloides*, *lignumvitæ*, guava, a coarse grass, and a climbing vine. Probably at times a serious pest. It has the same distribution as *A. howardi* (see previous paragraph). Occurs in Florida.

SPECIES NATIVE TO UNITED STATES.

1. Bay tree whitefly, *Paraleyrodes perseæ* (Quaintance). Reported only from Florida. Feeds on *Persea*, avocado, citrus and persimmon. Rarely common on citrus. Not a pest.

2. Florida whitefly, *Trialeurodes floridensis* (Quaintance). Reported only from Florida. Feeds on avocado, guava, *annona squamosa*, and citrus. Not a pest, except at times on avocado and guava.

3. *Trialeurodes vitrinellus* (Cockerell). Reported from Mexico on orange, and southern California on oak. Probably not a serious pest. Not known in Florida.

4. Mulberry whitefly, *Tetraleurodes mori* (Quaintance). Widely distributed over eastern United States, including Florida. Feeds on a large variety of plants, including mulberry, sycamore, maple, dogwood, hackberry, persimmon, holly, mountain laurel, etc. Found several times on orange. Not known to be a pest.

5. Mulberry whitefly, *Tetraleurodes mori*, var. *arizonensis* (Cockerell). Reported from Arizona and Mexico, but regarded by Quaintance as only a race of *T. mori* which has taken to breeding on orange. A pest of some importance in Mexico. Not in Florida.

SPECIES NOT IN UNITED STATES.

1. *Aleurocanthus citricolus* (Newstead). Reported only from German East Africa on *Citrus* sp. Probably capable of becoming a serious pest.

2. *Aleurocanthus citriperdus* (Quaintance and Baker). Taken by R. S. Woglum in Ceylon on an unknown tree, in India on *Citrus* sp., and Java on orange and *Citrus* sp. Regarded of considerable economic importance.

3. Spiny citrus whitefly, *Aleurocanthus woglumi* Ashby. Found in India, Ceylon, and Philippine Islands. Recently discovered in Jamaica, Cuba and New Province, Bahamas. Found infesting orange, grapefruit, *Citrus* sp., mango, avocado, guava, *Capparis roxburghi*, *C. pedunculosis*, *Morus* sp., *Salacia reticulata*, *Kurrimia zeylanica*, *Guiacum officinale*, *Cestrum nocturnum* L., and an unknown tree. A very injurious pest.

4. *Aleurocanthus spiniferus* (Quain.). Found on *Citrus* sp. and rose in Java, and on orange in south China. Not indicated if a pest.

5. *Aleurolobus marlatti* (Quain.) Found in Japan on orange, in India on *Citrus* sp, and *Morus* sp., in Ceylon on *Ficus* sp., and on an unknown tree in Java. Not indicated if a pest.

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[3] After the manuscript for this paper had gone to press specimens of *Aleurothrixus howardi* were taken on citrus at Miami, Florida. E. W. B.

6. *Aleurothrixus porteri* (Quain. and Baker). Found in Chile and Brazil. Host plants listed are: orange, a solanaceous plant, *Shimas dependens* Ortega, *S. molle*, Jaboticaba, *Lippia citriodora* Kunt, and Myrtus. Not indicated if a pest.

7. *Bemisia giffardi* (Kotinsky). Found on citrus trees in Honolulu, Hawaii, and an unknown tree in India. Probably a serious pest.

THE MELON FLY.

(*Dacus cucurbitæ* Coq.)

By Frederick Maskew.

I have been instructed to prepare for this quarantine number of the Monthly Bulletin an article on the melon fly and its work as a reducer of crop production. For the purpose for which it is intended and the source from which it emanates, this article must of necessity be both limited in scope and practical in tenor. The horticultural quarantine officers—as a rule—have not time for calm contemplation of the mysteries of biology or the intricacies of anatomical nomenclature. The nature of their work demands prompt decision and action, then on to the next arrivals and consignments for inspection, decision and disposition—a continuous performance from sunrise to sunset. All of those who are curious about the details of the habits and history of this fly are referred to the splendid monograph prepared by Messrs. Henry H. P. and Harry C. Severin and William J. Hartung, and published in "Annals Entomological Society of America, Vol. VII, No. 3," the fullest and most exhaustive treatise of this organism of which the writer has knowledge.

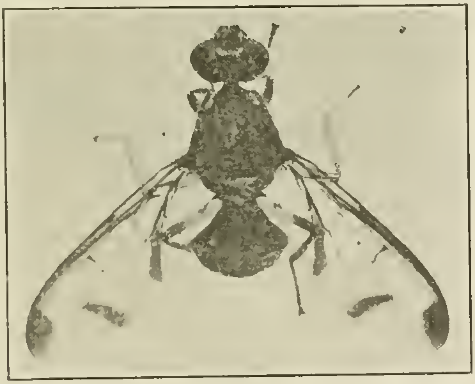

Fig. 107.—Adult melon fly (male) reared from material taken at quarantine. (Photo by L. A. Whitney.)

The present habitat of the melon fly covers a wide range of latitude with its corresponding meteorological conditions, from Nagasaki in the north, through the tropics to Queensland in the south. Its distribution east and west, however, appears to be much more limited at the present time than that of the Mediterranean fruit fly, the records showing the territory of Hawaii on the east and Bombay on the west as the limits to which it has extended its destructive operations in this direction. This is probably due to the fact that the infested hosts of this pest (vegetables) are less likely to be taken on shore and distributed by passengers than are the infested hosts (fruits) of the Mediterranean fruit fly. In November, 1898, George Compere first called attention to the presence and work of this pest in the vegetable gardens of Honolulu, and again to its presence in India in 1903. Time has verified the prophesies he ventured upon at that time in connection with this pest. Writing in 1914, Dr. H. P. Severin, with an intimate first-hand knowledge of the situation, has the following to relate:

> "Previous to the accidental introduction of this insect into Hawaii, melons were sold at ten cents each, but today the consumer often pays from fifty cents

> to one dollar for a watermelon. It has been estimated that the loss in the Hawaiian Islands amounts to almost a million dollars annually in tribute to this little fly, or a little over five cents a day for a family of four, on an estimated population of 192,000."

Five cents a day, $18.25 a year for each family of four, in a country where the production of vegetable crops is merely an incident to the general business of agriculture! No wonder the quarantine inspectors of California believe in the purpose of their daily work.

The adult melon fly illustrated in Fig. 107 is a small reddish-yellow fly, with a wasp-like appearance, and probably would not attract the attention of a casual observer among the many flies usually seen in a truck patch in which more or less decaying vegetable matter is customarily found. The melon fly, however, is discriminating, and holds no communion with such flies as confine their energies to reducing the rejected remnants of the crop to an inorganic condition, but, on the contrary, selects the best and freshest specimens in the field for destruction. No one thing made a more profound impression upon the writer during his investigations in the territory of Hawaii than the sight—in Chinese vegetable gardens at Mokuleia—of the melon flies stinging and apparently depositing eggs in a squash as small as a thumb-nail and from which the blossom had not fallen. What prospect can there be for any remuneration for the labor and cost of planting a crop with a constant repetition of this performance throughout the season? Severin gives the life cycle of the melon fly: minimum 29; maximum 43 days; and records the rearing of 637 melon flies from a pumpkin four inches long.

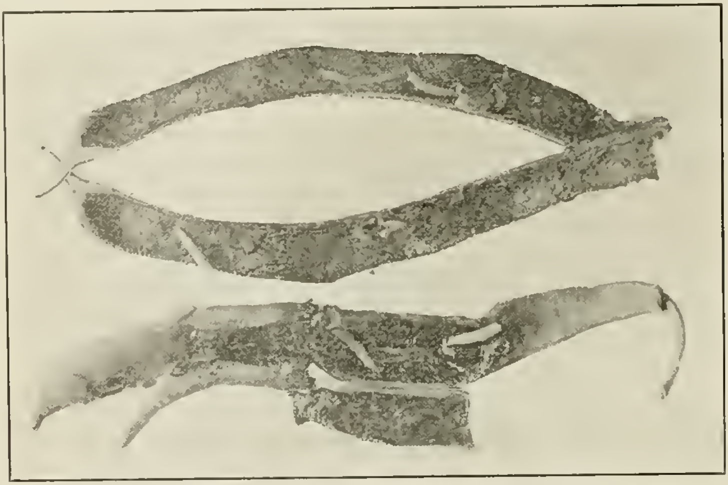

FIG. 108.—String beans infested with larvæ of the melon fly. Taken at quarantine. (Photo by L. A. Whitney.)

Fig. 108 is a photograph of two string beans taken from a lot found in the vegetable lockers of the steamship "Siberia" arriving at San Francisco from Honolulu on May 12, 1912, and is typical of the condition of fully 50 per cent of the beans in the lot—seeds and the fleshy parts partly eaten and the interior a mass of black decayed matter in which were hidden from four to nine maggots of the melon fly. A similar condition of infestation is often found in tomatoes, cucumbers and watermelons among the remnants of ship's stores left in lockers of vessels arriving at San Francisco from Honolulu. The melon fly has not such a large variety of hosts upon which it feeds as does the Mediterranean fruit fly, but when we digest the statistics covering the truck crops produced in California, the recorded list of its hosts is sufficient to set us to thinking. It has been found attacking and rendering unfit for food purposes muskmelons, green beans, cucumbers, tomatoes, squash, pumpkins, eggplant, watermelon, kohlrabi and luffra. Also, it is on record that this fly has been bred from the fruits of the mango, orange (?) and papaya.

Maggots of the melon fly illustrated in Fig. 109 were first detected by the horticultural quarantine officers of California in cucumbers found in the steamship "Umatilla" arriving at San Francisco in February, 1899. The latest findings were in cucumbers among the stores of the steamship "Rindjani" arriving at San Francisco from Honolulu on Sunday, May 20, 1917. During the interim between these two dates detection of this pest in the stores of ships arriving from Hawaiian Territory has been common; yet, notwithstanding the fact that California is more thoroughly and systematically patrolled and searched by horticultural inspectors than any other agricultural region of a similar area in the world, no evidence that the melon fly has become established in the state has so far been found or recorded.

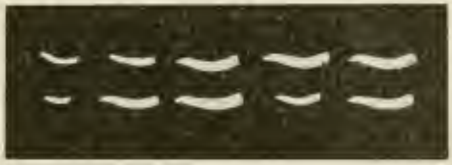

Fig. 109.—Maggots of the melon fly found in cucumbers. Taken at quarantine. (Photo by L. A. Whitney.)

The authority which forbids the entry of any or all hosts of the melon fly from the territory of Hawaii is found in the provisions of United States Notice of Quarantine No. 13 and in State Quarantine Order No. 4, and the authority to immediately destroy such hosts when brought into the state of California is found in section 5 of the state quarantine law.

THE MEXICAN ORANGE MAGGOT.

(*Trypeta ludens.*)

By Avery S. Hoyt.

From time to time the fruit growers of this state have had occasion for alarm because of the damage to similar crops in other sections of the world by insects not known to occur in California. It was because of this dread of serious fruit pests existing in other countries that the horticultural quarantine service in California was created. The next step in the policy of prevention, as indicated by our horticultural history, was the investigation to determine the extent of the ravages, the imminence of the danger of the introduction of the causal agent, the methods to prevent such introduction and control measures in the event such a pest should become introduced and established. To attain these aims the records show that it has been found advisable in the past to send experts to foreign countries to conduct such investigations at first hand and to prepare a fund of information which might be readily available should the emergency arise.

Such an investigation was authorized and conducted for the purpose of providing adequate protection to the fruit industry of California from the Mexican orange maggot. It was to investigate the life history and habits of and the damage caused by this fruit fly that the California State Commissioner of Horticulture sent John Isaac to Mexico on March 2, 1905. It is the purpose of this article to explain the reasons for the quarantine against all hosts of this fly rather than to present an account of its natural history. At the same time it is important that no pains be spared to acquaint all who are interested with a general idea of the appearance and habits of this insect. Consequently we offer here only the briefest description taken from Mr. Isaac's report of his trip to the Republic of Mexico.

The accompanying illustration shows three stages in the development of the Mexican orange maggot. The fly, slightly larger than the house fly, is orange colored with stripes of the same color across the wings. The larva, a maggot, is usually white with a tendency to assume the color of the host. When full grown the maggot is about three-eighths of an inch long, coming to a distinct black point at the head end. Two small black spots, part of the respiratory system, are easily visible at the blunt end. The full-grown maggot leaves the fruit and burrows into the ground where it passes into the adult stage. From thirty to forty-six days are usually required for this transformation. The complete life cycle from the egg to the adult requires about three months, thus permitting of four broods yearly. The female fly lays about seventy eggs, depositing them in quantities usually not to exceed eight or ten in a single fruit. From this it would appear that the spread of this fly, once introduced, might be accomplished with alarming rapidity.

It is exceedingly difficult to obtain accurate figures showing the damage caused by the Mexican orange maggot. The list of hosts include oranges, grapefruit, sweet limes, mangoes, peaches, plums, *Achras sapotes* and guavas. Mr. Isaac informs us that the production of oranges in certain localities of Mexico had been abandoned because of the activities of the fruit fly. He further states that the production of mangoes in such districts had been reduced to one-fifth of the normal crop.

In the horticultural records of California many instances are found of the capture of this insect in fruits offered for entry from Mexico. One such instance showing the danger of its introduction and the justification for the endless vigilance of the quarantine officers occurred at San Diego May 13, 1915. At that time thirty-two living pupæ of the Mexican orange maggot were found in a small package of guavas en route by parcel post from Mexico to Pasadena. This consignment coming at the very height of the orange season to Pasadena, situated as it is within the citrus belt, would afford a splendid opportunity for the spread of the fruit fly.

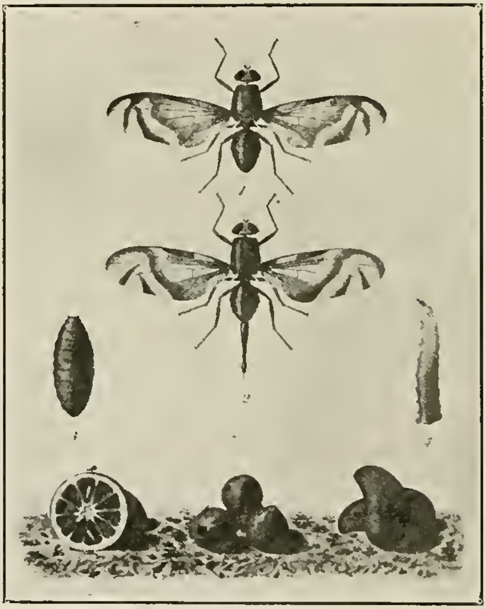

FIG. 110.—The Mexican orange fly (*Trypeta ludens*); (1) male, dorsal view; (2) female, dorsal view; (3) pupa; (4) larva; (5) female ovipositing on orange; (6) female ovipositing on guava; (7) female ovipositing on mango. The first four figures are greatly enlarged. The last three are greatly reduced.

The attempts at control of the fruit fly in Mexico have demonstrated that this is a very serious problem. The best results seem to be obtained by two separate and distinct processes aimed the one at the adult and the other at the maggot. A sweet poison spray is used to control the adults with varying degrees of success. The most effective control against the maggot is to collect and bury or burn all fallen fruit. This work to be effective must be done frequently, and in season would be an almost endless task. In view of the labor situation which exists in our farming communities, such a procedure would mean a very serious hardship upon the fruit grower, and the prime purpose of quarantine regulations and the activities of quarantine officers is to prevent any possibility of this additional cost to crop production by keeping this pest out of the state.

Legal measures designed to prevent the introduction and establishment of the orange maggot have been taken by both the federal and state governments. The importation of all its hosts from Mexico is prohibited in United States Notice of Quarantine No. 5. The immediate destruction of the hosts of the Mexican orange maggot when brought into California is authorized by sections 5 of the State Quarantine Law.

THE GIPSY MOTH AND THE BROWNTAIL MOTH.

By Harry S. Smith.

Two arboreal pests in which Californians are interested are the moths mentioned above. The State Commission of Horticulture has considered it unnecessary to quarantine New England against these pests, for the reason that they are perhaps the most easily detected of any insect enemies of trees which are likely to be introduced into this state. Also the Federal Horticultural Board sends to the horticultural quarantine officer an advance notice covering each and every shipment coming from the infested area into California, dealing in detail with each individual shipment covering the certificate, number, quantity, consignee, destination, date shipped, route and product, and includes plants, holiday decorations, Christmas trees, lumber and stone. Our quarantine guardians have acquainted themselves with the nature of these insects and have been instructed to keep close watch for them in any shipments from infested regions as well as from Europe. That they are continually on the watch is evidenced by the fact that both these pests have frequently been taken in this state on shipments of nursery stock.

The gipsy moth was accidentally introduced into New England in about the year 1869 by a Frenchman who was interested in silk culture and who was trying to develop a resistant strain of the silkworm in crossing it with the gypsy moth. Some of the insects which he had in captivity were allowed to escape and from this beginning the gipsy moth has gradually spread until it is one of the most important insect pests in the United States. For a number of years it has cost the federal government and the states infested a sum amounting to nearly one million dollars annually, and yet the insect continues to invade new territory in the northeastern states.

The female moth has about 2½ inches of wing-spread and is of a creamy white color with delicate brown markings. The abdomen is covered with buff hairs. The male is much darker in color and about two-thirds the size of the female. The eggs are laid on the trunks of trees and on rocks and fences, and are deposited in clusters of from 300 to 600. The egg clusters are covered by the hair from the body of the female moth, giving them the appearance of a small oval piece of chamois skin. The young larvæ are covered with long hairs and are so light that they are easily blown about by the wind. The full-grown larva reaches a length of nearly three inches and is prettily colored. The pupa is practically naked and of a dark brown color, and is found in protected places, on the trunks of trees, on rocks, fence rails, etc.

The gipsy moth passes the winter in the egg stage, hatching usually in the month of May. The larvæ are full-fed about the first of July and the moths emerge and the eggs are laid during this month. The caterpillars strip the trees and shrubs of their leaves, frequently completely defoliating the entire woodlands. They feed upon almost all of our deciduous trees, oak being the preferred host, and in the later stages will also feed upon the conifers.

The insect is distributed to a considerable extent on nursery stock and also on vehicles, lumber, quarry and other products. The caterpillars are also scattered by the wind as mentioned above, and by dropping into trolley cars, automobiles, etc. The females are unable to fly, so that no dispersion takes place by this means.

The control measures consist of painting the egg masses with creosote, which prevents them from hatching. The trees are also banded with tree tanglefoot, which prevents the young caterpillars from crawling up the trees. The most effective method of destroying the pest is a thorough spraying with arsenate of lead at the rate of five pounds of paste to fifty gallons of water.

The Bureau of Entomology has for several years carried on an importation of the most effective parasites of this insect from Europe. Many of these are now established in New England and are giving a good account of themselves. It is probable that in the woodland areas control will resolve itself into the use of natural enemies together with the cutting out of the favored host trees. The Federal Horticultural

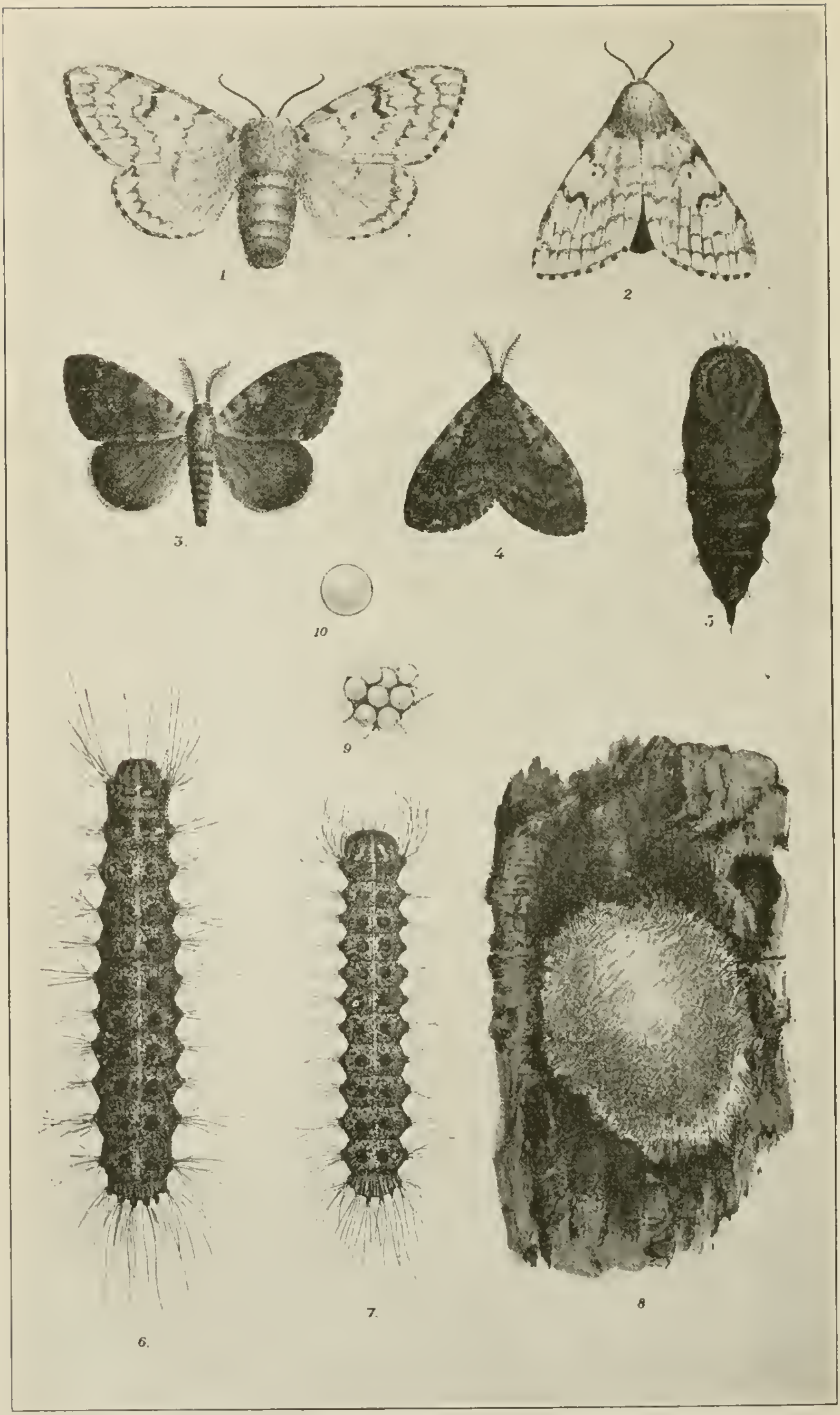
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Fig. 111.—Life history of the gipsy moth. (1) and (2) adult females; (3) and (4)

Board has established a quarantine covering the infested territory and from this region all nursery, quarry and forest products must be inspected and certified to before they are allowed to leave this area.

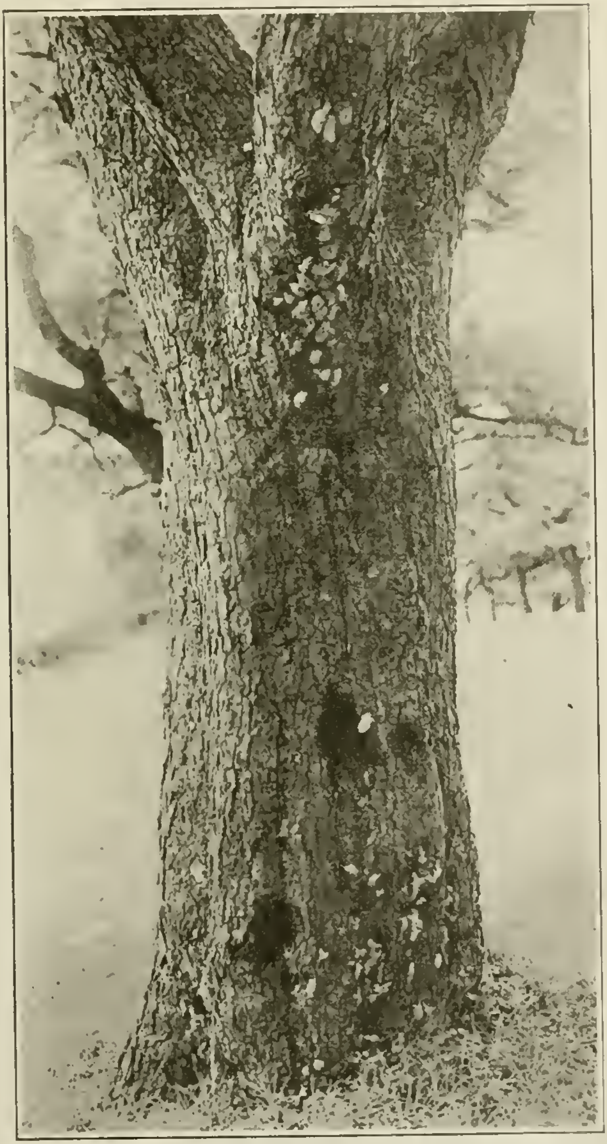


FIG. 112.—Egg clusters of the gipsy moth on an apple tree.
(Photo by D. M. Rogers, U. S. D. A.)

BROWNTAIL MOTH.

While the time and manner of introduction of the browntail moth into America is obscure, it was apparently accidentally introduced on nursery stock into Massachusetts about twenty years ago. It was first found in 1897 and at that time several townships were already infested. The insect occurs over a large area of central

Europe and is frequently taken in shipments of nursery stock, especially seedlings and roses from France and Belgium. It now covers most of New England as well as a part of Nova Scotia.

The browntail moth feeds on a large number of host plants, the most important of which are fruit trees, such as pears, apples and stone fruits. It also is destructive to shade trees, such as elm, oak, maple, etc.

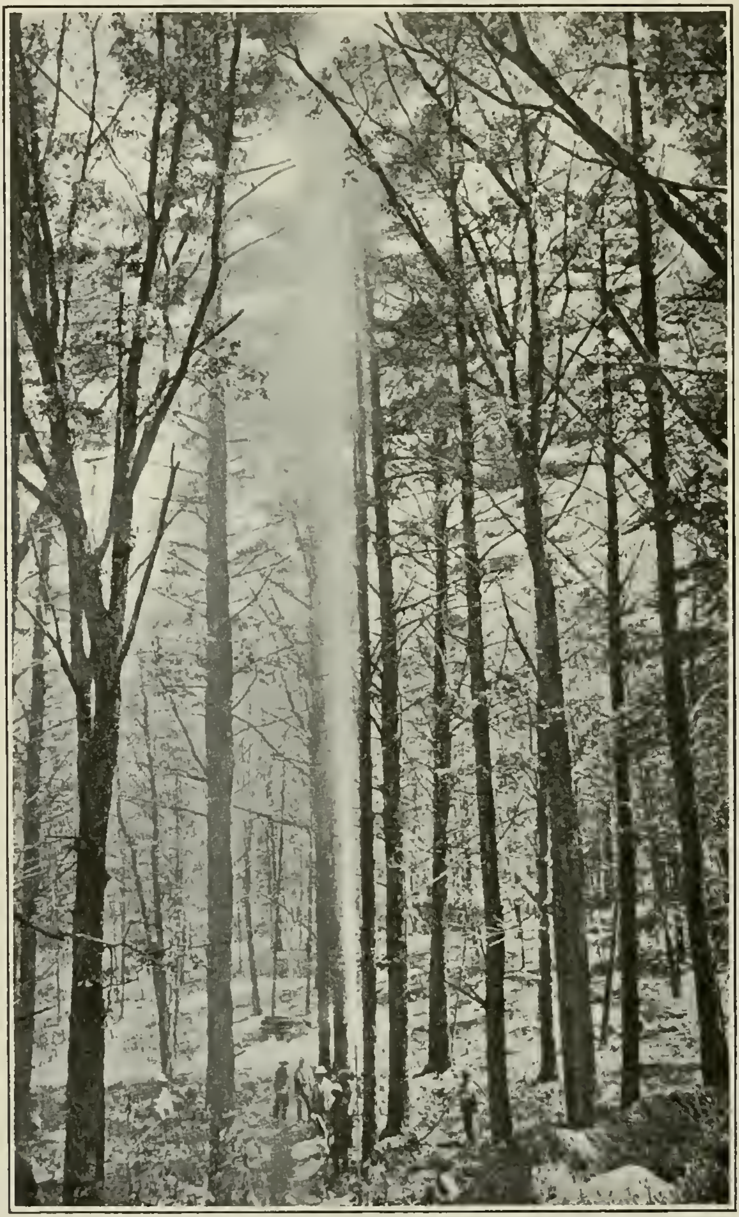


Fig. 113.—Spraying for the control of the gipsy moth in the forest. The caterpillars of this moth often become so numerous in Eastern forests that they entirely defoliate the trees. (Photo by G. E. Merrill.)

The eggs are deposited in July in masses of about 300. They are covered with the hair from the parent moth in a way somewhat similar to the gipsy moth. The eggs hatch during the late summer and some feeding takes place before cold weather sets in. They then form a nest by drawing the leaves together by means of silk. In this nest the young caterpillars spend the winter and when spring arrives they feed rapidly and develop into moths in June or July. It is in the form of this winter nest that the pest is usually found by quarantine inspectors.

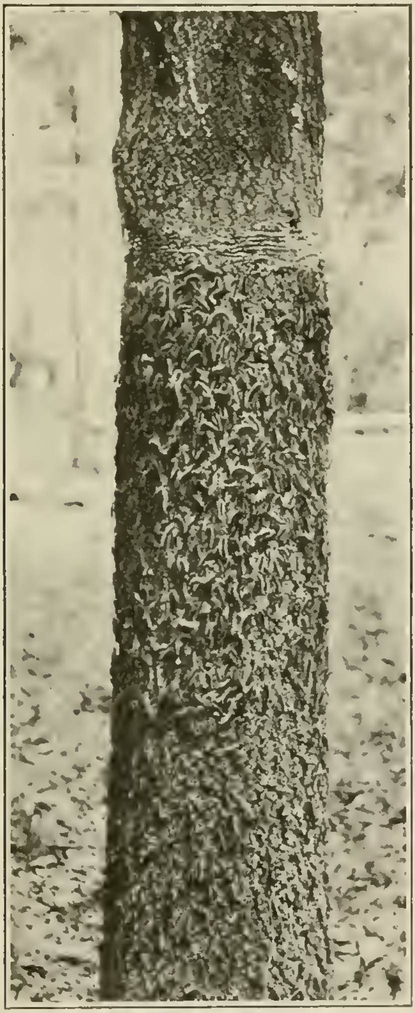


FIG. 114.—Caterpillars of the gipsy moth below a tanglefoot band. (Photo by D. M. Rogers, U. S. D. A.)

The adult moth of both sexes is almost pure white in color, with golden brown hairs at the end of the abdomen, which give them the name browntail moth. They are much smaller than the gipsy moth, their wing-spread being from one to one and one-half inches. The caterpillars are covered with poisonous hairs which cause a very painful rash when they come in contact with the skin.

The control measures consist in destroying the nests in the winter time and spraying the foliage in the early fall with arsenate of lead. The Bureau of Entomology has introduced a number of parasites of this insect from Europe, some of which are doing effective work at the present time.

THE MEDITERRANEAN FRUIT FLY.

By G. H. Hecke.

Of all the insect pests against which the Commission of Horticulture and the United States Department of Agriculture are guarding our fruit industry, the Mediterranean fruit fly (*Ceratitis capitata*) is most to be feared. This insect is one of the two-winged flies or Diptera and is a close relative of the orange maggot of Mexico, the melon fly of the Hawaiian Islands and other tropical countries, and the apple maggot or railroad worm of our Eastern States.

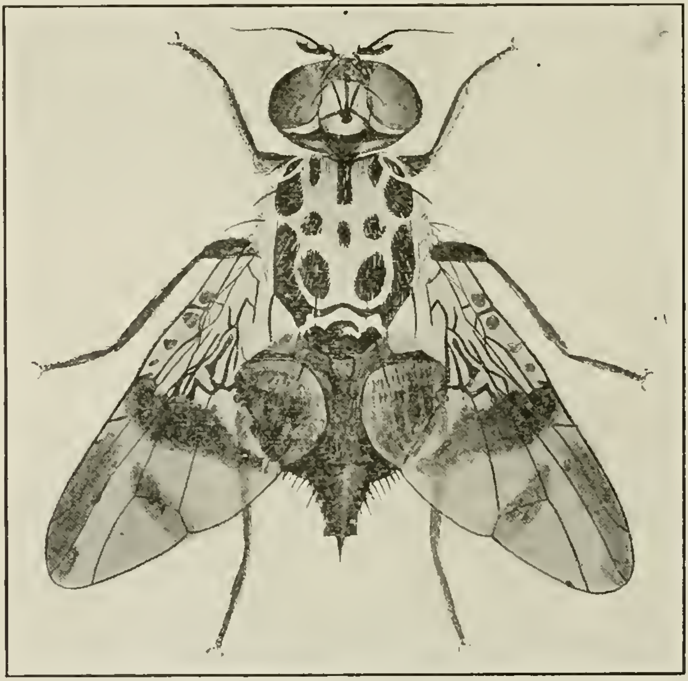


Fig. 115.—Adult female of the Mediterranean fruit fly. (After Birdnekoff.)

Although called the Mediterranean fruit fly, it did not originate in the Mediterranean region, but is supposed to be a native of Africa, where the family to which it belongs, the *Trypetidæ*, is represented by a large number of species. The present distribution of ths pest is Mediterranean region generally, Paris, Azores, Cape de Verde, Madeira, St. Helena, Bermuda, Hawaii, Queensland, New South Wales, Victoria, West Australia, Brazil, Cape Colony, Uganda, Egypt and Palestine.

The discovery of this terrible pest in the Hawaiian Islands in 1910 brought home to Californians, as nothing else could, the danger that threatens our fruit industry. This danger was fully realized by my predecessors, J. W. Jeffrey and Dr. A. J. Cook, and they made energetic efforts to guard against its introduction into this state by rigid quarantine regulations.

The Mediterranean fruit fly destroys a large number of fruits and vegetables. The full list is too long to give here, but it includes oranges, lemons, grapefruit, coffee, squash, persimmons, loquats, figs, tomatoes, mangoes, prickly pears, avocados, string beans, apricots, cherries, peaches, almonds, guavas, pears, quinces, apples and grapes.

The adult female fly is provided with an ovipositor or sting with which she punctures the host fruit and deposits her eggs beneath the skin in some numbers. A single female has been known to lay as many as 300 eggs. The eggs hatch in from two to five days the growing maggots then excavating galleries in the fruit and feeding upon the pulp. In ten to fifteen days the maggots complete their development, emerge from the fruit and bury themselves beneath the tree, where they transform to the pupal stage. After ten to thirty or more days, depending upon climatic conditions, the adult fly emerges, ready to begin anew its destructive work. It will be seen from this that the pest can undergo from six to twelve generations per year, and when we consider that each female can deposit as many as 300 eggs, it is easy to understand the destruction that may be accomplished when there are a sufficient number and variety of host plants.

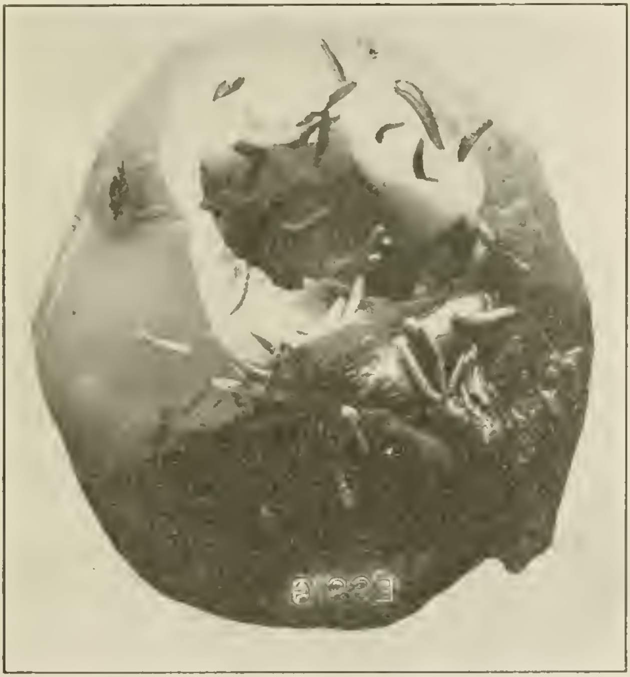


Fig. 116.—Larvæ of the Mediterranean fruit fly in a tomato. This is a sample of some of the dangers which are removed by the quarantine division. Taken in ships' stores from Honolulu. (After Essig.)

It is the enormous reproductive capacity of this insect, together with its large list of hosts, which makes it so formidable, and its habits are particularly disagreeable. Nothing more revolting can be imagined than to open a luscious (apparently) fruit at one's dinner table and find its interior a seething and wriggling mass of maggots, and the most unfortunate part of the matter is that so far no uniformly successful and at the same time practicable method of control has been devised, excepting possibly the poison bait spray used by Mally in South Africa. Some assistance can of course be hoped for in the introduction of natural enemies, some of which have already been established in the Hawaiian Islands by the territorial Board of Agriculture and Forestry.

This paper gives in the briefest possible way the salient facts in the life history and habits of this pest. To those interested in studying the question further are recommended the excellent paper by Dr. Back of the Bureau of Entomology, U. S. Department of Agriculture, published in the March-April, 1917, number of the Monthly Bulletin, and the publications of the Hawaiian Board of Agriculture and Forestry. It is expected that the Federal Bureau of Entomology will soon issue a complete report on this insect.

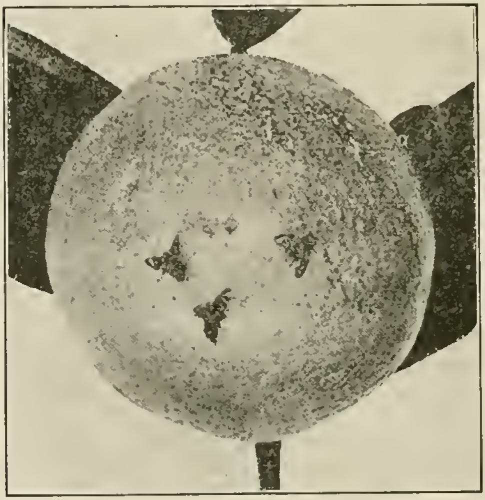


Fig. 117.—Adult female fruit flies at rest on an orange.

THE MONGOOSE.

That the framers of our State Quarantine Law were wise in classing the mongoose among the list of dangerous animal pests and making it a misdemeanor for any one to import same is apparent from the following excerpt of an article published in the Yearbook of the Department of Agriculture for 1898:

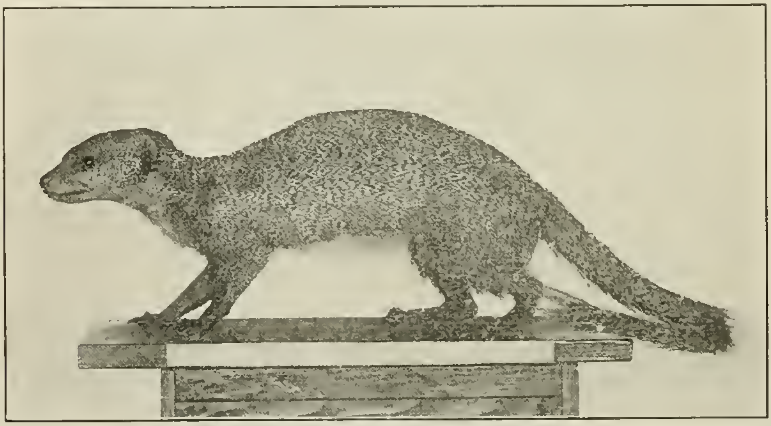


Fig. 118.—The common mongose of India (*Herpestes mungo*, pl.). (Photo by L. A. Whitney.)

> "The common mongoose of India (*Herpestes mungo* or *H. griseus*,) is a well known destroyer of rats, lizards and snakes, and has been introduced

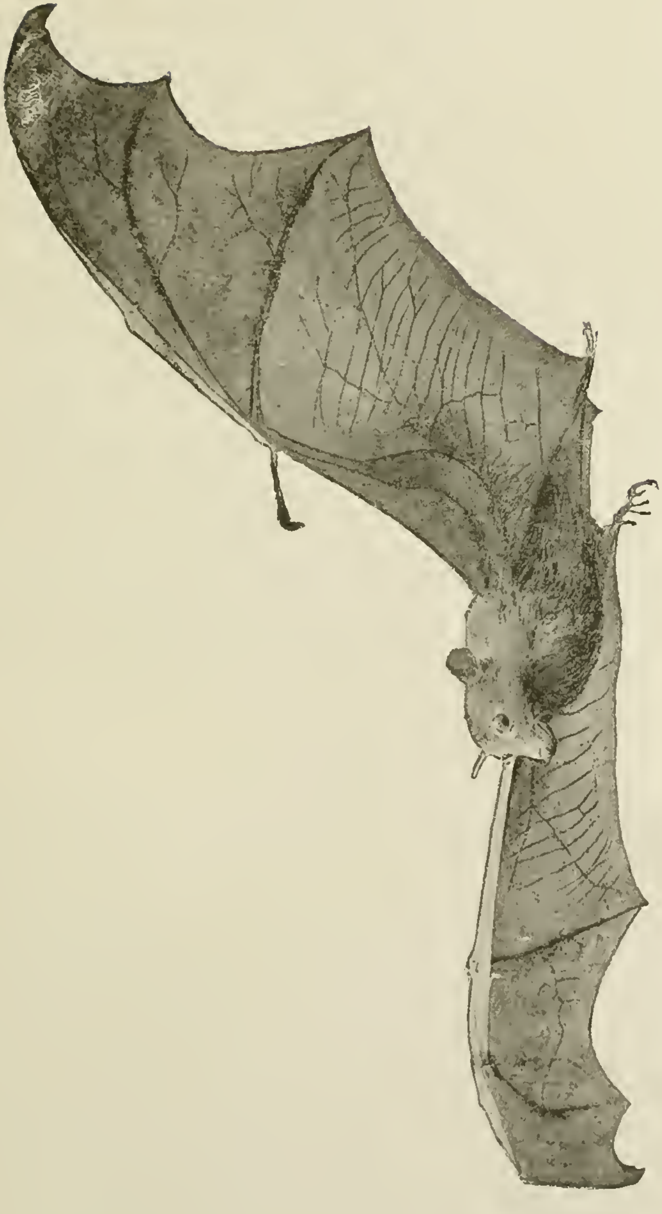


FIG. 119.—The flying fox (*Pteropus* sp.), as found in New South Wales where it is known as one of the most serious pests of the fruit growers. The bats of this genus, of which the largest is *Pteropus edulis*, often reach a size of five feet from one wing tip to the other.

> into Jamaica and other tropical islands for the purpose of ridding cane fields of rats. The annual loss which the island of Jamaica formerly suffered on account of the ravages of the introduced black rats (*Mus rattus*) and brown rats (*M. decumanus*), and the so-called 'cane-piece rat,' including the expense of destroying these pests, was estimated at £100,000, or $500,000. Various remedies were tried, but apparently with little success, until in February, 1872, Mr. W. Bancroft Espeut introduced nine individuals of the mongoose, four males and five females, from India. These animals increased with remarkable rapidity, and soon spread to all parts of the island, even to the tops of the highest mountains. A decrease in the number of rats was soon noticeable, and in 1882, ten years after the first introduction, the saving to the sugar planters was said to be £45,000 or $225,000, per annum.
>
> "Still the mongoose increased, and its omnivorous habits became more and more apparent as the rats diminished. It destroyed young pigs, kids, lambs, kittens, puppies, the native 'coney' poultry, game, birds which nested on or near the ground, eggs, snakes, ground lizards, frogs, turtles' eggs, and land crabs. It was also known to eat ripe bananas, pineapples, young corn, avocado pears, sweet potatoes, cocoanuts, and other fruits. Toward the close of the second decade the mongoose, originally considered very beneficial, came to be regarded as the greatest pest ever introduced into the island. Poultry and domesticated animals suffered from its depredations, and the short-tailed capromys, which was formerly numerous, became almost extinct except in some of the mountainous districts. The ground dove and the quail dove became rare, and the introduced bobwhite, or quail, was almost exterminated. The peculiar Jamaica petrel (*Estrelata caribbæa*), which nested in the mountains of the island, likewise became almost exterminated. Snakes, represented by at least five species, all harmless, and lizards, including about twenty species, were greatly diminished in numbers. The same thing was true of the land and fresh-water tortoises and the marine turtle which formerly laid its eggs in abundance in the loose sand on the north coast. The destruction of insectivorous birds, snakes, and lizards was followed by an increase in several injurious insects, particularly ticks, which became a serious pest, and a coccid moth, the larvæ of which bore into the pimento trees. In 1890 a commission was appointed by the government to consider whether measures should be taken to reduce the number of the animals, and the evidence collected showed conclusively that the evil results of the introduction of the mongoose far outweighed the benefits rendered to the sugar and coffee plantations."

FLYING FOXES.

The interesting and destructive bat, a full page illustration of which appears in this issue, would be a serious menace should it be introduced and become established in California. Therefore, its importation is prohibited by the State Quarantine Law. The following description is copied from the Yearbook of the Department of Agriculture for 1898:

> "Flying foxes belong to the genus *Pteropus*, one of the best known groups of fruit-eating bats. The genus includes some fifty species which are found in the tropics of the Old World from Madagascar and the Comoro Islands east to Australia, and Samoan Islands, and north to India, Malay Archipelago, and southern Japan. Five species occur in Australia, two of them as far north as New South Wales, but none are found in New Zealand or in the Hawaiian Islands. The largest species is the Kalong or Malay fruit bat (*Pteropus edulis*) which measures more than five feet across the tips of the wings.
>
> "The Australian bats are described as living in immense communities or 'camps' in the most inaccessible parts of the dense scrub of gullies and swamps. Here they may be seen by thousands, frequently crowded so thickly on the trees that large branches are broken by their weight. They fly considerable distances in search of food, sallying forth in flocks about sunset and returning to their camps before dawn. In New South Wales, and more especially in Queensland, flying foxes are one of the worst pests of the fruit grower, and are described as a plague which threatens the fruit-growing industry in a large part of Australia. They are particularly injurious to figs, bananas, peaches, and other soft fruits, and it is estimated that the damage done to orchards in the coast district of New South Wales amounts to thousands of pounds annually."

QUARANTINE DIVISION.

Report for the Month of April, 1917.

By Frederick Maskew.

Coming from practically every quarter of the globe outside of continental United States, 151 vessels arrived at the port of San Francisco during the first four months of this year, bringing with them a total of 12,555 passengers. In executing the provisions of the federal and state horticultural quarantine regulations, the inspectors intercepted 3,446 parcels of plant products in the personal belongings of these same passengers and the crews of the vessels in which they arrived. Out of these the contents of 537 parcels—or a little over 15 per cent of the total—were refused admittance into the state, and either with or without the consent of the owners were ultimately destroyed. Among the various contents of these 537 parcels that were destroyed were found live larvæ of the Mediterranean fruit fly in mangoes and coffee berries; larvæ of the melon fly in cucumbers; boll weevils in cotton bolls; fungous diseases on citrus fruit; citrus budding wood from canker regions; mealy bugs on ornamental plants; scale insects of many forms; borers in sugar cane; moth larvæ in dried fruits; aphids on vegetables, and live grubs to be taken as medicine.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	65
Passengers arriving from fruit fly ports	4,674

Horticultural imports:

	Parcels
Passed as free from pests	181,240
Fumigated	5,432
Refused admittance	267
Contraband destroyed	45
Total parcels horticultural imports for the month	186,984

Pests intercepted.

From China:
Larvæ of weevil in sweet potatoes.

From Connecticut:
Pseudococcus sp. and *Aphis* sp. on greenhouse plants.

From Costa Rica:
Pseudococcus sp. on orchids.

From Hawaiian Territory:
Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Coccus longulus on betel leaves.
Pseudococcus sp. on green cocoanuts.
Trypetid larvæ in coffee berries.

From Japan:
Fungus on citrus fruits.
Larvæ of weevil in sweet potatoes.

From Manila:
Pseudococcus sp. on rubber plants.
Larvæ of borers in orchids.

From Massachusetts:
Diaspis boisduvalii on orchids.

From New South Wales:
Calandra sp. in maize.

From Pennsylvania:
Chrysomphalus aonidum on *Ficus* sp.

From Tahiti:

Mite and lepidopterous larvæ in Tahitian chestnuts.
Morganella maskelli and fungus on oranges.

From Venezuela:

Diaspis boisduvalii and *Isosoma orchidearum* on orchids.

LOS ANGELES STATION.

Ships inspected	28

Horticultural imports:

	Parcels
Passed as free from pests	111,569
Fumigated	35½
Refused admittance	7¾
Contraband destroyed	7¾
Total parcels horticultural imports for the month	111,620

Pests Intercepted.

From Florida:

Lepidosaphes beckii and *Phomopsis citri* on grapefruit.

From Japan:

Aleyrodes sp. on gardenia.
Chionaspis wistariæ on wistaria.
Pseudococcus sp. on azaleas.

From Mexico:

Chloridea obsoleta on tomatoes.

From Ohio:

Aleyrodes sp. on hibiscus.
Aleyrodes sp. on jasmine.

From Washington:

Fusarium, *Rhizoctonia* and scab on potatoes.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	21
Fish boats inspected	28
Passengers arriving from fruit fly ports	46

Horticultural imports:

	Parcels
Passed as free from pests	8,202
Fumigated	4½
Refused admittance	2
Contraband destroyed	2½
Total parcels horticultural imports for the month	8,211

Pests Intercepted.

From Missouri:

Crown gall on deciduous stock.

From New York:

Aspidiotus sp., *Pseudococcus* sp., and *Aleyrodes* sp. on jasmine.

From Panama:

Musca sp. (larvæ) in potatoes.

From Pennsylvania:

Saissetia oleæ on ornamental plants.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	4

Horticultural imports:

	Parcels
Passed as free from pests	35

Pests Intercepted.

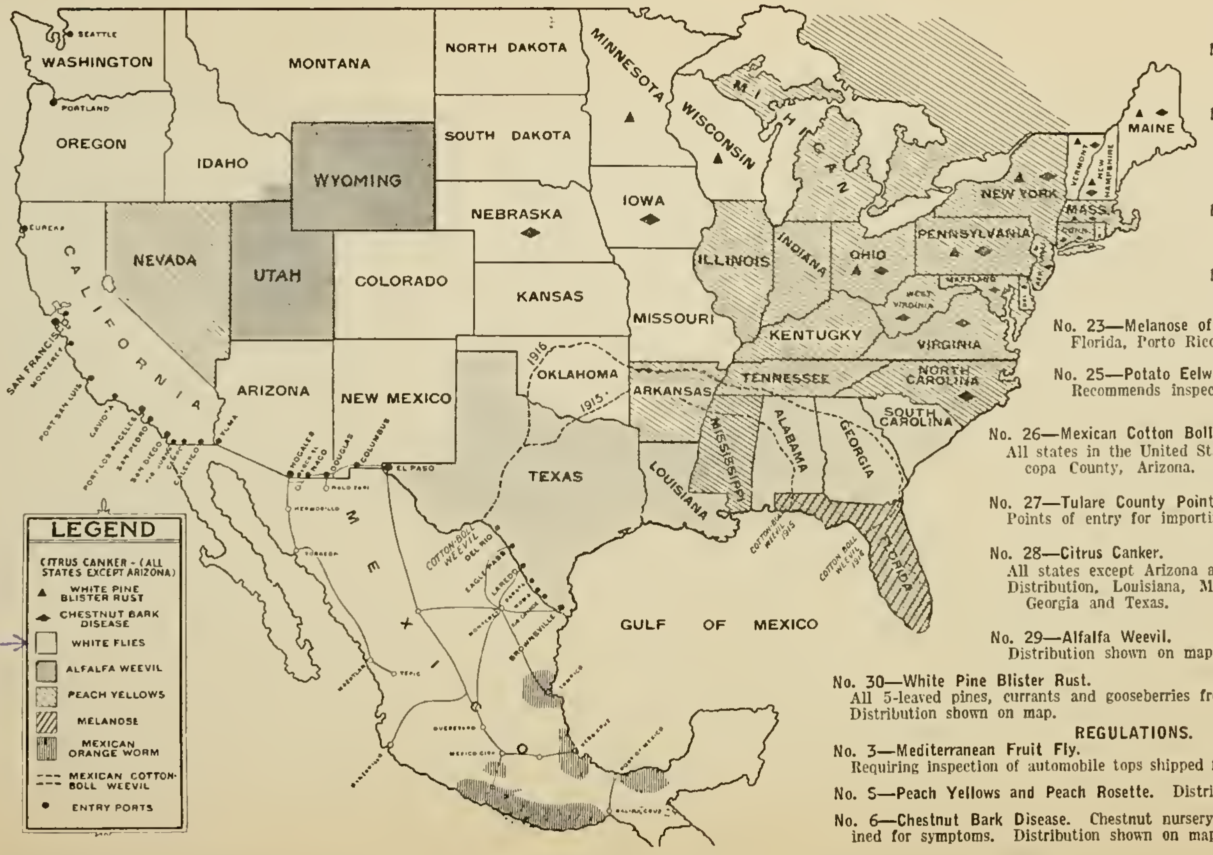
From Japan:

Gymnosporangium japonicum on *Juniperus procumbens*.

SANTA BARBARA STATION.

(No report.)

AREAS OF THE UNITED STATES UNDER PLANT QUARANTINE BY ORDER OF COMMISSIONER OF HORTICULTURE.


LEGEND
▲ CITRUS CANKER - (ALL STATES EXCEPT ARIZONA)
▲ WHITE PINE BLISTER RUST
◆ CHESTNUT BARK DISEASE
☐ WHITE FLIES
▩ ALFALFA WEEVIL
▦ PEACH YELLOWS
▨ MELANOSE
▥ MEXICAN ORANGE WORM
--- MEXICAN COTTON-BOLL WEEVIL
● ENTRY PORTS
WASHINGTON
SEATTLE
OREGON
PORTLAND
EUREKA
CALIFORNIA
SAN FRANCISCO
MONTEREY
PORT SAN LUIS
GAVIOTA
PORT LOS ANGELES
SAN PEDRO
SAN DIEGO
CALEXICO
YUMA
IDAHO
NEVADA
MONTANA
WYOMING
UTAH
ARIZONA
NOGALES
NACO
DOUGLAS
COLUMBUS
EL PASO
HERMOSILLO
TORREON
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
1916
1915
TEXAS
COTTON-BOLL WEEVIL
DEL RIO
EAGLE PASS
LAREDO
BROWNSVILLE
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
MICHIGAN
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
COTTON-BOLL WEEVIL 1915
COTTON-BOLL WEEVIL 1916
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
MARYLAND
PENNSYLVANIA
NEW YORK
VERMONT
NEW HAMPSHIRE
MAINE
MASS.
CONN.
MEXICO
QUERETARO
MEXICO CITY
TEPIC
MAZATLAN
TAMPICO
VERA CRUZ
GULF OF MEXICO

QUARANTINE ORDERS IN FORCE.

No. 4—Melon Fly.
Hawaiian Islands, Orient, Polynesia.

No. 5—Mediterranean Fruit Fly.

Hawaiian Islands, Australia, Southern Europe.

No. 13—Mexican Orange Worm (Fruit Fly).
Mexico.

No. 21—Citrus White Flies.
Distribution shown on map.

No. 23—Melanose of Citrus Fruits.
Florida, Porto Rico.

No. 25—Potato Eelworm.
Recommends inspection only.

No. 26—Mexican Cotton Boll Weevil.
All states in the United States quarantined except Maricopa County, Arizona. Distribution shown on map.

No. 27—Tulare County Points.
Points of entry for importing nursery stock.

No. 28—Citrus Canker.
All states except Arizona are quarantined against.
Distribution, Louisiana, Mississippi, Alabama, Florida, Georgia and Texas.

No. 29—Alfalfa Weevil.
Distribution shown on map.

No. 30—White Pine Blister Rust.
All 5-leaved pines, currants and gooseberries from east of Mississippi River. Distribution shown on map.

REGULATIONS.

No. 3—Mediterranean Fruit Fly.
Requiring inspection of automobile tops shipped from Hawaiian ports.

No. 5—Peach Yellows and Peach Rosette. Distribution shown on map.

No. 6—Chestnut Bark Disease. Chestnut nursery stock from all states examined for symptoms. Distribution shown on map.

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GA., FLA. N. C., S. C.

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Citrus Orchards from the Heights Above Riverside, California.

OF THE

STATE COMMISSION OF HORTICULTURE

SACRAMENTO, CALIFORNIA AUGUST, 1917

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THE MONTHLY BULLETIN.

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VI. August, 1917. No. 8

STANDARDS OF MATURITY FOR THE WASHINGTON NAVEL ORANGE.

By E. M. CHACE, Chemist in Charge, Citrus By-Products Laboratory, U. S. Department of Agriculture, Los Angeles, Cal.

Since the publication of the standard of maturity for Washington navel oranges by the Bureau of Chemistry in 1915, much interesting comment upon it has been made both by individuals and the press. This standard, popularly known as the 8 to 1 test, was first made public in the fall of 1914 as a tentative standard and was finally adopted after another year's investigations.

The standard depends upon the ratio between the soluble solids and the citric acid contained in the juice of the orange. The soluble solids of the orange consist of from 65 per cent to 80 per cent sugar, the remainder being chiefly citric acid, soluble forms of nitrogen, pectin, and other non-sugar material.

During the first season after the test had been published and given to the California growers, many interesting phenomena were discovered by various operators who were constantly testing fruit throughout the citrus regions. It soon became apparent that very green fruit would in many cases pass the test, owing to the fact that the acid had not yet reached the maximum. In the growth of an orange, there is a period when the ratio between sugar and acid is comparatively high, and as the fruit matures, the acid increases together with the sugar until the former reaches its maximum, after which it will decrease while the sugar continues to increase. This often results in an abnormally high ratio for a short period, followed by a normal and lower ratio, before the final ripening period sets in. An illustration typical of these cases was found in a Nordhoff grove. On December 26, the fruit from the selected tree in this grove contained juice having 11.8 per cent soluble solids and 1.63 per cent acid, giving a ratio of 7.2. On January 2 the solids had risen to 12.3 per cent and the acid to 1.75 per cent, giving a ratio of 7.0. On January 9 the figures were 12.4 per cent solids and 1.77 per cent acid, the ratio still being 7.0. On January 16 the solids were 12.2 per cent, the acids 1.81 per cent, with a ratio of 6.7 One week later, on January 23, the solids were 12.7 per cent, the acids 1.43 per cent, with a ratio of 8.9. On February 1 the solids were 12.5 per cent, the acid 1.46 per cent, the ratio being 8.6. On February 16 the solids were 12.6 per cent, the acid 1.57 per cent, the ratio being 8.0. On February 23 the solids were 12.8 per cent, the acid being 1.38 per cent, with a ratio of 9.3. After that date, with one exception, the solids-acid steadily increased.

While it had been recognized during the first season that some very green fruit would pass the standard, it had not been thought that such fruit would be given commercial consideration. There has, unfortunately, been some attempt, however, to take advantage of this fact and to ship fruit even before it had begun to approach the final stage of maturity, and the Protective Association in Tulare County, in order to meet this condition, adopted a color standard which prohibited the sweating of fruit before it had reached a color in excess of 50 per cent.

It was also discovered that unless the juice was thoroughly extracted from the pulp of the orange, that the correct solids-acid ratio could not be determined. Oranges which are very lightly squeezed have a lower solids-acid ratio than those which are thoroughly pressed. This is due in a large part to the fact that the pulp nearest the center of the fruit, which is first removed by the usual method of squeezing contains more acid and less sugar than that near the rind.

Another phenomenon was brought out in the fact that oranges, the juice of which contained a high percentage of soluble solids, and were therefore high in sugar, were found to taste sweeter than those containing a low percentage, even when the ratio of acid in the sweeter orange was higher than that in the poorer. This has led to many suggestions for a sliding scale, which would exempt from the standard to some extent, oranges containing high percentages of soluble solids. Peculiarly, most of these suggestions came from regions where the fruit does not mature early and therefore does not attain a high content of sugar soon enough in the season to permit early shipments even under a very liberal sliding scale standard.

Practically no data have been submitted with the suggestions made, and where figures were used as a basis of suggestion, they were from a limited number of analyses confined to one or two localities. The purpose of the present paper is to place before those interested in the subject, in a condensed form, such data as have been collected in all districts, which bear upon the question.

The purpose of the maturity standard is primarily to protect the consumer who purchases fruit which is fully colored, under the impression that he is obtaining food which will be satisfactory to his taste. Indirectly, also, the standard is a benefit to the orange grower in that it assures him that the purchaser will be satisfied with the fruit which he is selling, and in this way, create a demand for it. Thousands of dollars have been lost by the California industry in the past by shipment of both immature and frosted fruit, in which the purchaser was unable to detect the defect, and from which he turned after a single experience to other satisfactory fruit which was available at the time.

In the preparation of a sliding scale, the first question which must be decided is that concerning the point at which exemptions from the present standard should begin. In the light of our experience, extending over three seasons in California, we believe that an orange should only be exempted after the juice has reached a minimum of 13 per cent soluble solids, but in order to test the question fully, a set of sliding scales have been prepared, beginning at 13 per cent soluble solids, and lowering the percentage in ½ per cent steps until 11 per cent soluble solids has been reached.

Thus, if a sliding scale should be adopted which was based on 13 per cent soluble solids, fruit must contain juice having 13 per cent of soluble solids or over to come within this scale. Fruit not having reached 13 per cent would necessarily have to pass the 8-1 standard. If, however, it contains 13 per cent soluble solids, it would pass the standard when the ratio of soluble solids to acid reaches 7.5 to 1. Further, if the soluble solids had reached 14 per cent then the ratio at which the fruit would pass would be lowered to 7-1, and so on as set forth in the following table:

Scale Based on 13 Per Cent Soluble Solids.

Soluble solids in juice	Minimum ratio for passing
13 to 14 per cent	7.5 to 1
14 to 15 per cent	7.0 to 1
15 to 16 per cent	6.5 to 1
16 per cent and over	6.0 to 1

The second sliding scale to be considered is based on a minimum of 12½ per cent soluble solids; that is, in order to be included in the exemptions of this scale, the juice of the fruit must contain a minimum of 12½ per cent soluble solids. Fruit, the juice of which had not reached that figure, would still have to pass the 8-1 test. The following table shows the exemptions from the 8-1 ratio, which would be made by the adoption of this scale.

Scale Based on 12½ Per Cent Soluble Solids.

Soluble solids in juice	Minimum ratio for passing
12½ to 13½ per cent	7.5 to 1
13½ to 14½ per cent	7.0 to 1
14½ to 15½ per cent	6.5 to 1
15½ per cent or over	6.0 to 1

The third set of tables illustrates exemptions which would ensue from the adoption of scales based on 12 per cent soluble solids, 11½ per cent and 11 per cent.

Scales Based on 12, 11½ and 11 Per Cent Soluble Solids.

Sliding scale on basis of 12 per cent soluble solids		Sliding scale on basis of 11½ per cent soluble solids		Sliding scale on basis of 11 per cent soluble solids	
Soluble solids in juice	Minimum ratio for passing	Soluble solids in juice	Minimum ratio for passing	Soluble solids in juice	Minimum ratio for passing
12 to 13%	7.5 to 1	11½ to 12½%	7.5 to 1	11 to 12%	7.5 to 1
13 to 14%	7.0 to 1	12½ to 13½%	7.0 to 1	12 to 13%	7.0 to 1
14 to 15%	6.5 to 1	13½ to 14½%	6.5 to 1	13 to 14%	6.5 to 1
15% or over	6.0 to 1	14½% or over	6.0 to 1	14% or over	6.0 to 1

Whether or not such a scale would be of advantage to the several orange-growing districts of California may possibly be ascertained from the table which follows:

	Number samples examined	Per cent passing 8-1 test	Per cent passing sliding scale basing on 13 per cent solids	Per cent passing sliding scale basing on 12½ per cent solids	Per cent passing sliding scale basing on 12 solids per cent	Per cent passing sliding scale basing on 11½ per cent solids	Per cent passing sliding scale basing on 11 per cent solids
Butte County—							
Thermalito	27	29.6	29.6	29.6	29.6	33.3	44.4
Palermo	67	14.9	19.4	23.9	29.8	37.3	41.8
	94	19.1	22.3	25.5	29.7	36.2	42.5
Sacramento County—							
Fairoaks	47	0.0	0.0	0.0	2.1	6.4	6.4
Orangevale	20	5.0	5.0	5.0	5.0	20.0	20.0
	67	1.5	1.5	1.5	1.6	10.5	10.5
Placer County—							
Lincoln	13	15.4	23.1	23.1	23.1	46.1	53.8
Rocklin	7	0.0	0.0	0.0	0.0	0.0	0.0
	20	10.0	15.0	15.0	15.0	29.9	35.0
Solano County—							
Dixon	6	0.0	0.0	0.0	0.0	0.0	0.0
Fresno County	31	0.0	0.0	20.5	20.5	25.8	35.5
Tulare County—							
Naranjo	42	66.7	71.4	76.2	81.0	85.7	88.1
Lemon Cove	39	46.2	46.2	46.2	51.3	59.0	59.0
Exeter	51	52.9	52.9	54.9	59.0	60.8	60.8
Lindsay	111	39.6	41.4	43.2	44.1	49.5	54.9
Strathmore	31	54.8	61.3	71.0	71.0	74.2	80.6
Zante	34	47.1	47.1	47.1	47.1	55.9	64.7
Porterville	27	22.2	22.2	22.2	22.2	33.4	44.4
Plano	33	75.8	78.8	78.8	81.8	81.8	87.8
Worth	24	50.0	50.0	50.0	50.0	50.0	50.0
Success	23	47.8	47.8	60.9	65.2	73.9	78.3
Globe	13	76.9	76.9	76.9	76.9	76.9	76.9
	428	50.0	51.6	54.2	56.3	64.8	66.5
Ventura County—							
Nordhoff	33	57.6	63.6	63.6	72.7	78.8	90.0

	Number samples examined	Per cent passing S-1 test	Per cent passing sliding scale basing on 13 per cent solids	Per cent passing sliding scale basing on 12½ per cent solids	Per cent passing sliding scale basing on 12 per cent solids	Per cent passing sliding scale basing on 11½ per cent solids	Per cent passing sliding scale basing on 11 per cent solids
Los Angeles County—							
San Fernando	11	63.6	63.6	63.6	63.6	72.7	72.7
Whittier	42	66.7	66.7	71.4	73.8	81.0	88.1
Lamanda Park	13	69.2	69.2	69.2	100.0	100.0	100.0
Duarte	17	82.4	82.4	82.4	82.4	82.4	94.1
Azusa	11	54.5	54.5	54.5	54.5	54.5	63.6
San Dimas	84	39.3	46.4	46.4	51.2	63.1	67.9
Claremont	26	34.6	34.6	34.6	42.3	61.5	73.1
Lordsburg	72	34.7	36.1	40.3	50.0	56.9	63.9
Pomona	86	44.2	47.7	51.2	52.3	60.5	62.8
	362	46.7	49.4	51.7	56.4	65.5	71.0
Orange County—							
Fullerton	13	92.3	92.3	92.3	92.3	92.3	100.0
Orange	43	65.1	65.1	65.1	72.8	76.8	86.0
	56	71.4	71.4	71.4	76.8	80.4	89.2
San Bernardino County—							
Upland	41	12.2	29.2	41.4	51.1	60.8	63.3
Ontario	33	42.4	45.5	45.5	63.6	69.7	78.8
Cucamonga	26	92.3	92.3	92.3	92.3	92.3	92.3
Etiwanda	8	50.0	50.0	50.0	75.0	87.5	87.5
Bloomington	10	100.0	100.0	100.0	100.0	100.0	100.0
Rialto	1	100.0	100.0	100.0	100.0	100.0	100.0
West Highlands	11	100.0	100.0	100.0	100.0	100.0	100.0
Highlands	32	71.9	87.5	90.6	93.8	100.0	100.0
East Highlands	26	88.5	88.5	88.5	92.3	96.2	96.2
Redlands	27	51.9	51.9	59.3	70.4	77.8	85.2
	215	60.0	66.0	70.0	77.7	83.2	86.1
Riverside County—							
High Grove	20	80.0	80.0	80.0	85.0	85.0	100.0
Riverside	22	81.8	81.8	86.4	95.5	95.5	95.5
Arlington	12	100.0	100.0	100.0	100.0	100.0	100.0
San Jacinto	18	94.4	94.4	94.4	94.4	94.4	94.4
Corona	45	84.4	88.9	88.9	88.9	91.1	91.1
	117	86.3	88.0	88.9	91.5	92.3	94.9

In considering these data, it must be borne in mind that only those samples which were picked on or before December 15 are considered in the case of Butte, Sacramento, Placer, Solano, Fresno and Tulare counties, and that only samples picked on or before February 15 are considered in the counties of southern California, including Ventura. This division is made for the reason that, after careful consideration of the data, it has been found that after these dates, practically all the fruit has reached the S-1 test, in the respective districts, and therefore should not be considered in deciding the question. This materially increases the percentage of fruit passing the sliding scales over the percentage which would pass had all of the samples been considered.

The fact that no increase in the amount of fruit which could be shipped from a district would be obtained by the introduction of these sliding scales may be due to two reasons: First: A large percentage of the samples collected may have passed the S-1 standard. Districts of this type include Orange, San Bernardino and Riverside counties. There are subdistricts, however, where some increase in early shipment would be permitted by the adoption of a sliding scale, which is not apparent when the averages for the counties are considered. A striking case in point is the district of Upland, where of the 41 samples examined before February 15 but 12 per cent passed the S-1 test; while based on 13 per cent soluble solids, the number would have been more than doubled, and more than tripled when the scale was based on 12½ per cent. In Orange and Riverside counties, however, the local districts coincide reasonably well with the county averages. Second: While a small number of samples may have passed the 8-1 test, there may not be a sufficient number of samples containing above the average percentage of soluble solids to bring the fruit within the exemptions permitted under the sliding scale. In other words, in some districts, good fruit would not be affected because it already passed the 8-1 standard; in other districts, poorer fruit would not be affected for the reason that it does not contain a sufficient amount of soluble solids to come within the exempted classes.

Considering the matter as a whole, while there are undoubtedly exceptions to the rule, it does not seem that the adoption of the sliding scales as here presented, would materially increase the volume of early shipments. Of course, it can be said that the exemptions are not sufficiently liberal to permit any considerable increase, but as has been previously stated, the purpose of the standard is first of all the protection of the consumer, and when we consider the averages of all of the districts, it does not seem that a sliding scale is worthy of adoption, which is based on less than 13 per cent soluble solids, or certainly not on less than 12½ per cent; for, if percentages lower than those are considered, the scales will be based on fruit which is not much above the average of that sent from California during the shipping season.

Among other suggested standards which have been offered as a substitute for the 8-1 standard, is the color standard. It is a well-recognized fact that the oranges in the several districts of California do not color with equal rapidity. In some districts the oranges color before they sweeten; in other districts, they are quite sweet before colored, and the trouble with the color standard is that it will permit the shipment of very sour oranges from some districts and will prohibit the shipment of sweeter material from other districts. It is possible, however, that this discrepancy may be taken care of by sweating in districts where the coloring is not so rapid, and that the market will take care of the sour and more poorly-colored fruit.

The following summary is made from data collected during three years' work on the color shown by samples of oranges received at the laboratory. In the summary the term "substantially colored" is used to denote color in excess of 75 per cent. This is merely a relative term and the division is made at this point solely for the reason that it was considered that oranges which had colored to this extent might be shipped without sweating.

In Butte County, 21 samples of substandard oranges were substantially colored against 29 samples of standard oranges, and but two of the standard samples contained less than 75 per cent color. In Sacramento County, the ratio is very different, for 38 samples of substandard oranges were substantially colored while all of the standard samples (12 in number) were above 75 per cent. In Placer County, the ratio of fully-colored substandard samples to fully-colored standard samples is 9 to 3; in Solano County, 1 to 2. In Fresno County, on the other hand, but 12 samples that were below the 8-1 standard were substantially colored; while 34 standard samples were up to that mark. Tulare County, which is one of the districts where the fruit becomes sweet before it changes color, shows but 40 substandard samples colored above 75 per cent, and 444 standard had reached that color. In Los Angeles County, 147 substandard samples were 75 per cent to 100 per cent colored, against 360 standard samples of the same color. In Orange County, there were but 9 substandard samples substantially colored, against 57 standard samples of the same color. In San Bernardino County, the ratio was 40 to 191. In Riverside County, only 1 substandard sample was substantially colored, while 98 samples above standard had reached 75 per cent. In Ventura County, the ratio is 15 to 53.

Considering these data from another point of view, it was seen that in Butte County, with the samples below a ratio of 6-1 the greater part are very green; with a ratio of 6-7, the oranges are about evenly distributed between the four classes of color; from 7-8, the majority are fully colored. The standard oranges are practically all substantially colored. The same is true of Sacramento County when fruit below a ratio of 6-1 is considered, but when it reaches a ratio of from 6-7, a greater part (that is, 19 out of 24 samples) is substantially colored; from a ratio of 7-8, 16 out of 17 were substantially colored, while all the standard fruits had reached that color. In Placer County, the same fact holds true for fruit below the 6-1 ratio; between a ratio of 6-7, the samples were evenly distributed as to color, but from 7-8 and above standard, all samples were fully colored. In Fresno County, the color begins to appear in samples with a ratio of 6-7; between 7-8, nearly 50 per cent of the samples were fully colored, and above 8-1, over 80 per cent had reached the last stage of color. In Tulare County, below 6-1 no samples are substantially colored; samples having a ratio between 6-7, only 7 per cent are substantially colored; between 7-8, 25 per cent; above standard, over 75 per cent of the samples are well colored. In Los Angeles County, samples having a ratio below 6-1, over 20 per cent are well colored. Those having a ratio between 6-7, over 50 per cent are well colored; those with a ratio of 7-8, nearly 90 per cent are well colored, while samples above standard are practically all fully colored. In Orange County none of the samples below ratio of 7-1 were substantially colored; 9 out of 15 samples with a ratio between 7-8 had reached that color, while all of the above standard samples were well colored. In San Bernardino County, 15 out of 21 samples with a ratio of 6-7 were well colored; 35 out of 38 with a ratio of 7-8, and over 90 per cent of the standard samples were well colored. In Riverside County, also over 90 per cent of the samples were substantially colored. In Ventura County, all of the samples examined were fully colored, 4 out of 68 having a ratio of 6-1 to 7-1; 11 having a ratio of 7-1 to 8-1; and 53 being above standard.

In considering these data as a whole, it will be interesting to compare the averages obtained on all the samples for the period during which work was carried on. These averages, together with the number of samples, are given in the following table:

District	Number samples	Solids	Ratio
Butte County	110	12.17	7.3
Sacramento County	96	11.17	6.4
Placer County	22	12.32	6.5
Fresno County	67	11.49	9.6
Tulare County	88	11.91	9.3
Ventura County	68	13.42	9.4
Los Angeles County	562	12.47	9.1
Orange County	73	12.00	9.7
San Bernardino County	358	12.95	9.9
Riverside County	172	12.65	11.0
Averages		12.25	8.8

SUMMARY.

The introduction of sliding scale standards would not allow any considerable increase in the early shipments of oranges. While certain limited localities might increase early shipments by such changes in the present standard, the increase in shipments would be comparatively insignificant. The adoption of a sliding scale based on 13 per cent or 12½ per cent soluble solids would have very little effect upon the industry.

The adoption of a color standard will permit the shipment of a considerable quantity of oranges which have not reached the 8-1 test in a great majority of the districts, and in a few districts will permit the shipment of very immature and sour oranges.

STANDARDIZATION OF PLUM AND PRUNE PACK.

By Charles Rayburn, Placerville, Cal.

This article is intended to deal with the necessity of standardization in the pack of plums and prunes for commercial sale, either in the Eastern markets or elsewhere, in so far as the same applies to the grower of the Placerville district.

So far as the writer knows we have always, during the past twenty years at least, used the so-called regular Eastern four-basket crate, each basket in the crate measuring 8 inches square at the top and 6½ inches square at the bottom and usually 3¾ inches deep. The baskets are so shaped for the principal purpose of allowing them to be telescoped for shipping and it also allows ventilating space around them when in the container and filled with fruit. A regular pack of plums and prunes calls for three layers in each basket—the stem end being down, or, at least, out of sight.

During the early days of deciduous fruit packing for Eastern markets many growers packed and are still packing their plums and prunes with the small sizes in the bottom of the basket and the large ones in the middle top layer, and the difference is sometimes so great that the purchaser of the package in the East has complained justly that the fruit was "topped off." Just a word in support of this complaint. Picture five plums of equal size packed across the bottom of each basket. Each plum so packed will measure 1-3/10 inches in diameter. Picture five plums packed across the top of each basket and each plum will measure 1-6/10 inches in diameter, the difference being 3/10 of an inch in diameter, which, in itself, does not appear to be a very great difference. Assuming that the fruit is spherical in shape, then each specimen in the bottom will contain 1.15 plus cubic inches, and each specimen on the top will contain 2.14 plus cubic inches. The bottom fruit therefore contains but 53.6 per cent of the cubical contents of the fruit that is in the top of the basket.

Because of the fact that the Eastern market complained of the fruit being "topped off" together with the fact that their fruit was continually arriving on a declining market, the growers of El Dorado County were compelled early in 1910 to band themselves together in what was then and is now known as the El Dorado County Standardized Fruit Alliance. They formulated laws and by-laws for governing their organization, and adopted rules for packing, which are still in existence—improving in some instances, but never receding from their first aim—that of improving their methods of producing and packing the best fruit shipped from California. The county that gave California its birth was the first county of the state to formulate the highest standard rules for packing now in vogue.

It is necessary for plums and prunes, according to the grading rules, to be free from all disease or defect; to be packed in regular Eastern four-basket single crates, three tiers to the basket; of a size not smaller than would make a 5x5 if packed in the top layer and of approximately uniform size in each layer. Exceptions: Tragedies, Germans and Splendors may be solid packed and faced, or four tier.

Two-tier plums and prunes not smaller than would make 4x4 may be packed in 4½-inch crates or wrapped and packed in 4½-inch peach boxes with an 11/16-inch cleat under the lid. Tragedies may be packed 5x5 bottom and center and 5x6 top.

Four-tier pack of blue plums and prunes except Giants, Gross, Grand Duke and Diamond is allowable. There may be other varieties added to these different exceptions that will come up from time to time for consideration.

This method compels the grower to put up his fruit in a manner that is free from deception. The fact that the basket is smaller at the bottom than at the top is regarded as no excuse for the use of fruit on the bottom that is materially smaller than that on the top. On the other hand, it compels him to grade his fruit and make different packages for the different sizes and pack the same as other fruits. Plums that will make a good 5x5 pack on top will make a good 4x4 pack on the bottom, and a 4x5 or 5x5 pack in the center and top, which, when the package is opened and the contents turned out, will show fruit that is approximately the same size throughout the package.

A two-tier package of plums is used for the large elongated varieties. A special provision is made for all of the medium and small varieties permitting them to be packed four tier in a regular Eastern four-basket crate which must be so marked. This four-tier pack has been the safety valve of our pack of plums in this county; and has, I believe, been the real reason why our fruit has brought magnificent prices on the auction. We could do much better had we the legislation to govern it. It gets rid of the temptation to cover up the small fruit in the bottom of the package. It allows many a crate of plums to be shipped when the market is high without ruining the reputation of a high standard when the market is only average or low. It has placed El Dorado County at the head of the list in point of standardizing and has brought dollars into the pockets of our growers instead of loss. This determination of growers to ship four-tier plums and prunes properly marked is in the writer's opinion, the key to the upholding of a fixed standard for packing plums and prunes. I believe that the four-tier pack of plums and prunes is to the plum package what the Jumbo crate for cantaloupes is to the cantaloupe business. I believe that the basket in common use having sloping sides does not necessarily mean that small fruit should be packed in the bottom and larger fruit on top in plums any more than is the case with peaches, apples, oranges or cantaloupes, or any other fruit in straight sided packages.

APPLE STANDARDIZATION.

By A. W. Tate, Chief Apple Inspector, Watsonville.

Owing to the many changes made in the horticultural laws of the state by the legislature which has just adjourned, it is possible that many of the county horticultural commissioners have not, as yet, realized the additional duties and powers conferred upon them by the Standard Apple Act of 1917. While the brunt of the enforcement of the law will fall upon the state inspectors appointed by the State Commissioner of Horticulture, no small share of responsibility rests upon the county commissioners.

The law is, in a way, an experiment, but in order to give it a fair test, and to find out whether or not the sponsors of the idea of apple standardization have made a mistake, it is absolutely necessary that a proper degree of cooperation, of all concerned in its enforcement, be obtained. It is possible that the majority of the county commissioners are not at all familiar with its provisions, and it is because of this fact that this paper has been prepared. It is hoped then, that the writer will be pardoned if he seems to enter into detail regarding certain portions of the law, with which, it might be expected, the county commissioners were entirely conversant.

Section 13 of the act reads as follows:

"Any apples packed, shipped, delivered for shipment, offered for sale or sold, in violation of any of the provisions of this act, and the containers in which they may be, shall be deemed to be a public nuisance, and may be seized by said commissioner of horticulture, or his deputy, or by any inspector appointed under the provisions of this act, and by any county horticultural commissioner or his deputy, and by order of the superior court of the county or city and county within which the same may be found, shall be condemned and destroyed or released upon such conditions as the court in its discretion may impose to insure that they shall not be packed, shipped, delivered for shipment, offered for sale or sold in violation of any of the provisions of this act."

It will be noted that any apples packed in violation of this act are a public nuisance and may be seized, not only by the state officials, but also by the county commissioners or their deputies.

As state inspectors will be in charge of the larger shipping districts at least, the county commissioners will be called upon chiefly to see that the fruit arrives in the proper condition in the markets. In other words, the commissioners of the counties in which the apples are sold, will be expected to see that there is no violation of the law. They are therefore supposed to know what constitutes the different grades and the proper markings upon each box.

There are three grades established for any apples, packed, shipped, or sold within the state in closed packages. They are the "Fancy," "B" and "C" grades. While the grades formulated apply only to apples in closed packages, section 5, to which I shall call attention later, covers all fruit, whether closed or otherwise.

"Fancy" apples shall be hand-picked, well-matured specimens of one variety, well colored, with stems retained therein, except in the case of Gravensteins, for which variety an exception is made, uniform in size, and by uniformity it is stipulated that the largest apple in the box shall not be three-eighths of an inch in diameter, measured by the smallest diameter thereof, larger than the smallest apple in the box. They shall be well packed, by which I take it to mean that when the cover is placed upon the box there shall be no excess space or room for one apple to move upon another, and shall be free from all insect pests and defects or diseases. A variation in this respect is allowed not to exceed 3 per cent of any one defect or 10 per cent total defects.

The "B" grade is the second grade of apples. In this grade are allowed insect bitten apples, where the wound so caused has healed in the process of maturity; sunscalds and frost bites, which do not extend beneath the surface of the skin, and bruises where the skin is not broken; also stemless apples. "B" grade apples should be suitable for storage, so no defect which might interfere with the keeping qualities should be included in this grade.

A "C" grade is provided for, but as it is not thought that any one will find it to his financial advantage to pack this grade, I shall not enter into detail, suffice it is to say that practically anything may be packed in a box of "C" grade without regard to size requirements, provided it is free from insect pests and diseases.

Certain data must appear upon the branded or labeled end of the box. Nearly all labels, as far as I am aware, conform in most respects to the requirements of this section of the law. The grade must be shown, and, when state stamps are not used, this must be designated in letters not less than one-half inch in height. The number of apples contained or the net weight of the package (this is to comply with the Net Container Act and the restrictions imposed by certain other states), name of variety, if known, otherwise to be marked as unknown, the name and address of the person who packed or caused it to be repacked, also the date of packing or repacking. A variation of five apples, more or less, is allowed from the number stated.

Where state stamps are used, it has been customary in the enforcement of the 1915 law to use a rubber dating stamp to cancel the stamps used, the date of cancellation showing the date of inspection and packing.

There has been some objection to placing the date of packing upon the box, but I wish to say that this is intended for the packer's own protection. A box of apples might be in good condition when it left the shipping point, but a month or more later be far from complying with the law. Unless there be some way of determining when it was packed the packer would be held responsible throughout the season.

Under the Standard Apple Act of 1915 the inspection was made, except in such few instances when the chief inspector might make a personal examination, while the apples were being packed. This seemed the most convenient and desirable way, as it was thought that the inspectors would be able to detect undergrade fruit and it would not be such a hardship upon the packer to re-sort rather than to both re-sort and pack fruit which did not come up to standard. It was found, however, that it was very hard for the inspectors to determine the exact percentage of poor apples in the grading bins, and furthermore, it left a way open to unscrupulous packers to substitute uninspected fruit for that which the inspectors had examined. It would seem necessary to combine inspection of the packing process with a thorough examination of the finished output and this is the procedure which will be adopted, at least in the Watsonville district, under the new law.

The act provides that stamps shall be designed and sold by the State Commissioner of Horticulture and the person using such stamps has a right to have inspection in his own packing house.

Every grower, every packer or shipper, of California apples will be benefited by the Standard Apple Act of 1917. There is no favoritism, so it is no more than just to ask that all bear their pro rata of the expense of the enforcement of the law. There is but one way whereby this can be accomplished, and that is by having inspection at shipping point and the use of the stamps provided.

It should not, and, I trust, will not be necessary for the county commissioners to pay any attention to any boxes of apples bearing the state stamp which shows they have already had inspection.

There are only two reasons why the shipper should not care to have his fruit inspected at home and use the stamp. Either his fruit is so good that he does not fear to take the chance, or it is so poor that he knows it could not pass, and trusts to luck that, either through lack of interest on the part of the county commissioner of the county to which the shipment may be made, or because there is no complaint on the part of the receiver, his fruit may squeeze through.

Any apples appearing in any market without the state stamp should be regarded with suspicion by the county commissioners and be given very careful scrutiny.

In conclusion, I hope that the county commissioners will give the state inspectors all possible aid in the enforcement of this law, particularly in regard to section 5, which forbids the sale of apples infested with any insect pest or infected with any disease. This section is intended to prevent the dumping of undesirable fruit into this state from other states, which do not allow the sale of same within their own boundaries, but wish to use California as a by-products factory, as well as to protect the grower, who tries to raise good apples, in competition with his neighbor who refuses to care for his orchard. In many counties it is compulsory to eradicate insect pests and diseases, but in others, especially in our larger apple-growing districts, the commissioners, through lack of funds, are unable to undertake anything of the kind. Under such conditions, the quickest and easiest way to compel a man to take care of his orchard is to forbid the sale, in the open market, of inferior fruit. When the orchardist realizes that he can not dispose of insect-infested or diseased fruit except to a by-products factory, he is going to awaken to the fact that he must either spray and care for his orchard in such a way as to produce a good marketable article, or go out of business.

We do not relish the idea that growers in other states are shipping grades of apples into California which it is illegal to sell at home, but we can not expect to find the consumer in California standing behind us, unless we first remedy the evil in our own midst. Section 5 not only keeps out inferior fruit from other districts, but forbids the sale of same even if produced in California and should be rigidly enforced.

Commissioners can also be of assistance by calling the attention of the buyers in their counties to the purposes and provisions of the law and emphasizing to them the fact that they assume as much responsibility as the packer unless they insist that any fruit they may buy bears a state stamp or they have a guarantee as provided for in section 14 of this act.

STRAWBERRY INSPECTION IN SACRAMENTO COUNTY.

By Fred C. Brosius, Deputy County Horticultural Commissioner, Sacramento, Cal.

Sacramento County produces annually, for commercial use, approximately 900 acres of strawberries, grown by 170 growers, five of whom are Caucasians, the balance being Japanese.

The berry fields range in size from one-half to twenty acres. They are usually planted upon shallow, hardpan soils, and often are the intercrop for young vineyards, and provide a living for the grower until the young grapes begin bearing.

When the berries are planted early enough, a small crop is obtained in the summer of the first year, but the best fruit and heaviest yields are obtained in the second and third years; about the fourth year, owing to a lack of proper fertilizing, the plants degenerate very fast; the berries are very small and inferior in quality, and are usually plowed under after the first crop of this year, in order to make way and enable the grower to give the grapevines his entire attention.

As the young grapevines are planted eight feet square, the berry beds are made in long rows about seven feet wide with a deep irrigation ditch fifteen inches wide between each bed. This allows one ditch to each row of grapes.

The berry vines are planted 18 inches apart and about 12 inches back from the ditch. As the plant puts forth runners, these are so placed and rooted so that at the beginning of the second year, they cover the entire area of three feet back from the ditch, each way, requiring about eleven-rooted runners from the parent plant.

When these are full grown, they allow only a narrow path in the middle of the bed for the picker's use, one person picking from side to side over the entire bed as he goes along.

The three principal varieties now commonly grown are in their order of maturing: Jesse, Oregon Plum and Dollar. The Jesse is large in size, but rather soft, and is used very little for distant shipping and is fast being supplanted by the Oregon Plum, which is much larger, sweeter and certainly the most attractive berry. While not quite as firm and while not possessed of the shipping qualities of the Dollar, it has commanded very high prices in the markets of the North during the entire past season.

The Dollar berry is by far the best shipper grown in this district. It colors well, and is fairly uniform in size and very firm. This variety averages in a normal year about 250 crates per acre, while the Oregon Plum, being much larger and therefore requiring a less number per basket will often yield 500 crates per acre.

Crates contain 20 one-pint baskets, weighing 12 ounces each or 15 pounds net per crate. It generally requires about three men to pick and pack two acres of ripening berries per day. These men average 10 crates per day when picking by day work, but during the height of the season when piecework prevails they pick from twelve to fifteen crates per day at from 27 to 34 cents per crate.

Much of the poor packing is done by the hired pickers at this time, who, caring very little about the owner's responsibility to the law, pick to suit themselves. During the rush season, when labor is scarce, they dictate their own terms to the growers, and if the grower remonstrates about the condition of the pack they will often leave him on the slightest provocation, work being plentiful elsewhere at this time.

Prior to 1916 a concerted effort was made by the various shippers of the Florin district in an earnest endeavor to enforce some sort of standardized pack. Inspectors were employed to visit the various fields and endeavor to have the berries packed in accordance with the rules agreed upon, but lacking any authority to enforce these rules, the attempt became a pronounced failure.

Therefore, when the Standardization Law of 1915 became effective for the season of 1916, in the case of berries intended for interstate shipment, most of the shippers were glad to extend the inspectors their hearty cooperation.

As each of the 170 growers pack on their own fields, a copy of the law printed in Japanese was nailed in each packing shed. Each grower was numbered, and provided with a rubber stamp corresponding to his number, which he was required to stamp on each crate intended for interstate shipment, as this was the only means possible of identifying the packer of the crates when they arrived at the loading station.

The various fields were divided into several districts, one inspector being assigned to each district, who visited each packing shed in the morning, and also the pickers in the fields, instructing packers and pickers as to what would be required to make the pack "reasonably uniform in size, quality and maturity throughout the package or container."

In the afternoon the inspectors assembled at the loading stations where the crates are loaded into iced express cars, and as each load arrived from the fields, a few crates were opened to determine the shipping condition of the berries before allowing them to be loaded into the cars. If in the opinion of the inspector the berries were not in condition for shipment out of the state, or if not properly packed, they were rejected and the grower was permitted to sell them locally or within the state. This practice soon gained for the inspectors the title of "sorter of fruits," and in a large measure weakened their position. The effort of the field inspectors was thus partly wasted, as with some growers it was immaterial to them where the berries were marketed.

However, the revised law of 1917 effective for the season of 1918, has been materially strengthened and will apply to berries sold locally as well as those shipped out of the state, and therefore a more rigid inspection will be enforced, and fruit rejected in the future must be repacked or sold to the cannery.

During the season of 1916 and 1917 but three arrests were made and these only after repeated warnings had been given to the obstinate growers. In each case they were very indifferent to the inspectors' requests.

Much improvement of the pack was manifested where the grower would require his pickers to stamp each individual crate with the picker's number or letter. The indifferent picker could then be discharged when his pack did not show improvement, after the first warning. However, this simple method was used only in a few cases; another feature which may be necessary if labor continues short and wages go higher, is the curtailment of large plantings to fields of four or five acres. With this limited acreage, the grower can usually harvest his crop with a minimum amount of labor and keep up with the fast-ripening berries.

The average price per crate for the six weeks' shipping season of 1915 before standardization was enforced was about ——; for 1916 the average was $1.13, and for 1917 about $1.30. During the six weeks' season of this year, approximately 200 cars or 180,000 crates were shipped to interstate markets, from nine different loading points. Of these, probably 2,500 crates were rejected by the inspectors. The total cost of inspection was $510.

Several factors have combined to make the increase price during the last two seasons. Better distribution in markets of the Northwest and favorable climatic conditions have assisted, but the general improvement of the pack as enforced has very materially increased the demand, for, during the past season, many dealers of the Northwest have placed buyers in the field, knowing that the berries would not be shipped unless of uniform quality and properly packed.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE. WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical and other publications of a similar nature.

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Apple Standardization.

The standardization of the apple pack for the California trade, under the provisions of the act of 1917, will mean much to the industry which has always suffered because of the fact that a certain class of growers have insisted in packing low-grade, almost worthless trash, and certain dealers haven't hesitated about handling it. The effect upon the market for good fruit has been little short of disastrous. The apple is grown in practically every state of the Union, and with no other fruit is there the same chance for overproduction. During seasons of good crops throughout the country the supply is such that only the high-grade fruit will pay for marketing, and even during seasons of far below average crops there is little demand for the lower grades. There is need for more standardized prices in the apple business and the standardization movement should do much toward bringing to the grower uniformly good prices year after year.

The work of inspection and the general enforcement of the act is placed in the hands of the State Commissioner of Horticulture. This added duty to our already full schedule of work has taxed us to the limit, but no effort will be spared to make apple standardization of real value to the industry.

Chief Deputy George P. Weldon has been placed in charge of the work throughout the state and is responsible for the working out of details in connection with the enforcement of the act. His experience in the apple sections of the state, and his personal acquaintance with the apple growers makes him the logical man in the commission to handle the job.

It is believed that the state seal which will be provided by this office under the terms of the act, and for which the growers pay the sum of a half cent each, will be an important part of the standardized pack. It will virtually say that the box on which it occurs contains fruit that is true to the grade designated on the same, and the state of California approves of it. The inspection, therefore, must be carefully conducted; the packer and the inspector should cooperate to the fullest extent, and any attempt at packing a lower grade than the "C" grade provided for in the act must be promptly stopped.

The inspection of apples in the large markets will be of very great importance. With the aid of the county horticultural commissioners, and with the cooperation of the better class of commission men little trouble is anticipated, and it is our purpose to standardize the California apple pack in the way that was intended by the framers of the act.

G. H. H.

Citrophilus Mealybug Problem.

The recent meeting of the Claremont Pomological Club and other citrus organizations at Pomona shows the deep interest which the fruit growers of southern California feel in the *citrophilus* mealybug problem. No other question before the meeting evoked as much discussion or held the attention of the growers so firmly. The mealybug is always a live topic where citrus growers get together, and well it may be, for it is probably the most dangerous insect pests of citrus we have in California. I am not a pessimist, but we must recognize the fact that the *citrophilus* mealybug is here to stay, and any possibility of eradicating it that may have existed in the past has now gone by. We must now evolve some satisfactory method of control. This we fully expect to see brought about.

There are at the present time three institutions working toward the control of this pest; the U. S. Department of Agriculture, the Citrus Experiment Station and the State Commission of Horticulture. With such forces arrayed against it and all working together in harmony, the mealybug is sure to meet its Waterloo sooner or later. The Department of Agriculture and the Citrus Experiment Station will devote their attention to such means of control as spraying, washing, fumigation, etc., while we will take care of such phases of the problem as quarantine and control by natural enemies. By such an arrangement as this each side of the question will receive the attention it deserves and nothing will be neglected which gives any possibility of relief. We expect to see the closest cooperation between the three institutions studying the *citrophilus* problem. The different lines of work are well defined and all that is necessary is a mutual feeling of confidence and a spirit of helpfulness on the part of each. This spirit is in evidence at the present time and will, I believe, continue until a satisfactory solution is reached. G. H. H.

The Modesto Conference and Striking Illustrations of the Value of Thorough Team Work.

From the viewpoint of things accomplished, valuable initiatory work and cordiality of social spirit, together with loyal teamwork along every line of horticultural endeavor, the Modesto conference last month made history. It exemplified the old saying that "One tinge of sorrow, and we are all of one kin." Every move was prompted by a patriotic purpose to serve the country. Enlisted in that effort to serve were men from almost every county in the state of California, who are alive to the needs and requirements of the times and thoroughly cognizant of the dangers confronting the nation. These men represent a vital part of the great army for service.

A change from normal conditions nationally has wrought changes locally. New laws have been enacted to better conserve and protect the interests of the people. These state and county horticultural officials and inspectors are charged with the enforcement of these laws, and they accept the duty with a thorough and willing thoughtfulness rarely experienced.

The spirit of emulation was noticeable; that of faultfinding and complaint, absent. Everywhere it was manifestly plain that the various representatives were seeking for a more advanced knowledge in order to better serve the people of state and nation.

Hon. A. F. Naftzger, vice chairman of the State Council of Defense, delivered a fine address. It was filled with the rich meat of patriotic service. Others contributed their part cheerfully and rendered splendid service in making the conference the success it was.

The papers read, the discussions that followed and every utterance was along constructive lines. The hotel accommodations, the spirit of the people of Modesto and especially of the delegates blended to make a successful and harmonious total. The Modesto Conference will long be remembered by those privileged to attend as one of the most successful in the history of the horticultural meetings in California.

Commissioner Hecke feels under lasting obligations to all those who contributed to this most excellent conference. H. S. M.

"Drone Trees."

At last the fact is becoming generally recognized that trees, like people, possess individuality, and that certain inherent tendencies are responsible for some of their good or bad characteristics. The work that has been done in southern California by A. D. Shamel of the United States Department of Agriculture, in the improvement of varieties of citrus fruits through bud selection, has shown that there is a wide variation in the bud characteristics which has resulted in the development of inferior strains of a variety through propagation from undesirable buds.

Mr. Shamel has cooperated with growers in the work of keeping individual tree records, and as a result of the investigations it has been found that 25 per cent of the trees on an average, are inferior and do not produce satisfactory crops. The term drone trees is applied to these and expresses clearly the fact that there are trees that, like the drone bee, are incapable of producing, at least not enough to pay for the work which they entail. A fair and conservative loss due to the presence of the undesirable bud sports in the performance record plots is estimated as $100 per acre.

The California Fruit Growers Exchange has recently, in line with its progressive policy, established a department of bud selection, known as the "Fruit Growers Supply Company." A letter from Mr. Shamel, who is cooperating with the Exchange in this work, contains the following information regarding the special line of work that it is proposed to follow: "The purpose of this work is to furnish reliable buds of the best strains of our commercial citrus varieties, to citrus growers, nurserymen, and others. It is a public service institution. It is a cooperative and organized effort to standardize and improve our citrus production for the benefit of the producer and consumer alike."

Careful work along the same line as that done with citrus fruits is needed for deciduous fruits, every orchardist who keeps close track of the crops harvested from his individual trees, realizes that there is a marked variation in their production; that there are good and bad trees in his orchard. Certain nurserymen in a small way have at times attempted to propagate their stock from carefully selected buds taken from trees that had produced good crops. This work is commendable but has not been carried far enough. There is a lack of carefully attained scientific data which it is hoped will be available in the near future. The forward movement of the California Fruit Growers Exchange will mean much to the citrus industry through the elimination of a large percentage at least of the drone trees that are now planted in every orchard. It is hoped that the movement will be such a success that it may soon be extended to the deciduous fruit industry. G. P. W.

White Pine Blister Rust Suppression.

The seriousness of the white pine blister rust disease of five-leafed pines, currants and gooseberries, which made necessary the passage of quarantine order No. 30 of this office, is indicated from the following figures representing the appropriation made by the Federal Government and a number of states, for the purpose of carrying on a campaign for its suppression:

Federal Government	$300,000	(1 year)
New Hampshire	28,000	(2 years)
Maine	10,000	(2 years)
Rhode Island	2,500	(1 year)
Pennsylvania	10,000	(1 year)
Minnesota	15,000	(1 year)
Massachusetts	50,000	(1 year)
Vermont	25,000	(2 years)
Connecticut	20,000	(2 years)
New York	25,000	(1 year)
Wisconsin	15,000	(1 year)
Ontario	1,500	(1 year)

G. P. W.

COUNTY COMMISSIONERS' DEPARTMENT.

ADVISERS' AND COMMISSIONERS' UNITED ACTION FOR COUNTY AND STATE.

By H. M. ARMITAGE, County Horticultural Commissioner, San Diego, Cal.

It is needless to enlarge upon the fact that the most important problem facing the nation today is that of an increased production of every agricultural product, particularly of the staple food crops, not only to insure a successful outcome to the world war but to insure the proper provisioning of the world in the immediate years following the war.

It is a certainty that the immediate results demanded along this line can not be obtained by an hysterical opening up of large acreages of land to new or untried crops and processes by persons without the necessary means or proper experience or training, particularly in the face of an almost sure labor shortage. The problem must be handled by more intense, scientific farming of the lands already under cultivation by the men on those lands or by persons with agricultural experience and training.

Considering increased production from this standpoint there are three important factors concerned, namely: finances, labor and increased scientific knowledge of agriculture in all its phases. As only the latter factor concerns both the farm adviser and the horticultural commissioner, it alone need be considered in relation to the present subject.

The agricultural institutions of the country have maintained in the field, scores of investigators of agricultural problems, have edited reams of valuable farming information, and, up to recent years, there the process has stopped. This information was stored away to await the demand of a public, who, though in dire need of it, were either unaware of its existence or ignorant of how to obtain it. It therefore became necessary to employ some agency through which this information might be placed directly in the hands of those persons needing it, and to that end the farm adviser movement was inaugurated. Up to the present time the amount of money appropriated by the Federal Government has limited the number of agents or advisers that might be appointed under this system. The demand for increased scientific agricultural knowledge under present conditions, however, is being met by increased appropriations for agricultural extension work from the War Emergency Fund. California's share of these appropriations will make it possible for the University to place a farm adviser and assistant in practically every agricultural county in the state. Such being the case, it becomes important that the county commissioners, who to a certain extent, partly through necessity and partly as being correlated with their regular duties, have been filling the position of farm adviser in their respective counties, consider the value to their county and state as a whole, and work with most sincere cooperation with these advisers.

A thorough knowledge of what the farm adviser is and what he may do, and a clear conception of the duties and powers of our own office, is necessary to such cooperation. Professor Crocheron, state leader of the farm adviser movement, officially defines a farm adviser as "a man trained in agriculture, usually a graduate of an agricultural college, who has had some practical experience in the broad phases of agriculture and who is conversant with the particular problems that concern the locality to which he is assigned. His duties are the giving of advice to those who desire it, on soil treatment, fertilization, crop adaptation and culture, animal husbandry and its allied phases. Being concerned in the increase of net returns to the farmer, he is also desirous of improving those civilizing forces of the open country that come under the head of better roads, schools, churches, farmers' organizations and marketing facilities. He studies those various activities of the farm that are known under the head of farm management and demonstrates his better methods on the farm of those interested parties who desire to cooperate with him. He has the forces of both the Federal Department of Agriculture and the agricultural college of the state in which he is working to assist him in the solving of any problems he may meet with, which, owing to the technical phases involved, are impossible of his individual solution." His efficiency, or value to the county, is dependent upon an organization of farmers of the county, known as the county farm bureau. The plan of this organization is such that it places him in immediate and direct contact with the individual desiring his services, and conversely, makes it possible for the individual to be in touch with the adviser at all times. This organization, made up of the more progressive farmers of the county, is often an asset to the commissioner in his work, as will be considered later.

Considering the horticultural commissioner, the office was created, through necessity, for a specific purpose, namely: the protection of the agricultural interests of the state, as a whole, by preventing the introduction of serious insects, plant diseases, animal and weed pests from without and by enforcing concerted action against, and preventing the further dissemination of the pests already introduced and established within. The qualifications of many of the men entrusted with the proper application of the horticultural laws are equivalent to those required of a farm adviser. All of them are qualified by previous training and experience along the particular lines concerned. While the work of the horticultural commission is based upon legal power to enforce action by the individual for the benefit of the majority, he often finds it advisable in the interests of permanent results, to act the role of adviser rather than police officer. The functions of the two offices, therefore, stand out about as follows:

The work of the farm adviser is strictly educational; his field of operations unlimited in scope but limited in application to those who desire his services. The results are dependent upon organized action by the farmers of the county. The work of the horticultural commissioner is based upon police duty. His field of operation is legally limited to the protection of agricultural interests of the state from serious pests. His results are intended to be based on forced action, but are permanent only when obtained through cooperation with the individual.

In a certain sense, then, the duties of the two offices are similar, in that they depend for their best results on the education of the farmer to the better methods of farm operation and management. The bulk of the operations of the commissioner is being confined to one phase of the question, the protection of insect, plant disease pests, etc., in which he is a specialist, and which in itself constitutes a very small part of the field open to the adviser. A thorough understanding between the offices should prevent any duplication of work and a deference to the opinion of the proper office, in matters relating to the larger problems coming under their jurisdiction, would not injure but would promote the value of both offices to the county. This brings us down to the question of the benefits to be derived by each office from a thorough understanding of the other, such understanding working directly to the benefit of the county and the state as a whole. One unavoidable restriction placed on the energies of the farm adviser is that he may only give his services where requested. This means that he will have considerable difficulty in reaching many of those who are most in need of these services. There is many a farmer today who is like the man asked to sign a petition requesting the abolition of capital punishment in his state; in refusing, he replied, "Capital punishment was good enough for my father and grandfather, and I guess it is good enough for me." The old farm methods and ideas were good enough for his father and grandfather and far be it from him to call in a college graduate to tell him how to run his place, and yet the commissioner visiting him in the course of his regular duties may often find the opportunity to tactfully do farm adviser work which otherwise would not be accomplished. Cooperation between the two offices may eventually number this grower among the members of the farm bureau and among the progressive farmers of the county.

Is there a commissioner here who has sufficient inspectors to keep in continual touch with the crop and pest conditions of his county? I know that I have not. The farm adviser visits every section of the county at least once a month and therefore is placed in direct touch with field conditions. Cooperation between the offices would make it possible for the commissioner to obtain valuable information necessary to the proper conduct of his office, which in the stress of other duties might have gone unnoticed. This may not be of importance in the smaller counties, but I can assure you that it is in the large ones.

Should we desire to start a campaign against a certain pest in a certain locality, it is necessary that we have the backing of the representative growers of that district. Cooperating with the farm adviser movement we have at hand an organized body of men desired in that locality, with whom we can meet and outline our plans. With their backing, successful results are assured. As stated before, we are specialists along this particular line of pest control, and I believe that any farm adviser who has the interest of his work at heart will be only too glad to be relieved of such work that he may devote his time to those more important problems of farm economics which are truly beyond the scope of the duties of the commissioner. I know that the adviser has instructions from the University to secure the cooperation of the horticultural office when projecting any such compaign on his part. The understanding between the two offices should permit the commissioner to give information on any farm problem, the adviser on any question relating to pests and their control, the only requisite being that the information given by either office on the same subject, follow the lines of the latest information in the hands of the office under whose jurisdiction the question would properly fall, be to all intents and purposes, identical. This would only be possible through a close relation between the two offices.

Considering the present food problem, the farm adviser, where present, has rightly been appointed chairman of the committee on food resources and supplies. There are, however, many phases of this work, which in the interests of immediate results, could be efficiently handled by the horticultural commissioner. At this time every government man is supposed to apply his energies where they will do the most to assist in this work, and you will find the adviser more than glad to share his burdens with you.

In considering the relations between the offices, I have purposely left out the personal equation. That matter can only be solved by each individual officer for himself.

Summing up the situation, a lack of cooperation between the two offices tends to create an amused public, and the advisory value of either or both offices to the county and state might easily be destroyed. If each commissioner will do his share towards sincere cooperation, he will find that the adviser will meet him more than half way and the services of both offices will be materially strengthened.

COOPERATION—STATE AND COUNTY COMMISSIONERS.

By C. W. BEERS, County Horticultural Commissioner, Santa Barbara, Cal.

The superior courts of California are a bulwark of strength and dignity commanding the respect of other states because, instead of being courts of local county affairs, the legislature has made them a system of state jurisdiction, the judges thereof being interchangeable from county to county, the state paying a portion of the compensation, and the whole system being thus unified in action and cooperation, creating a perfect working machine. At the same time there is afforded to each judge opportunity for individual opinion and decision, encouraging and fostering personal excellence and initiative.

The different units of the University of California partake of the stregth and preeminence of the greater institution, so that every special school, experiment station and college carries all the prestige of the great University, of which each is a vital part.

There is this very same need for an organization of the different elements of the state's system of quarantine and horticultural interests, calling for an intimate cooperation between the different units that compose the forces working for the general advancement of the splendid industries that are directly influenced by this body of workers. And the same excellent results that have been obtained by the correlation of other bonds of individuals may be obtained by just such a unifying and cooperating movement among the commissioners. This is not a case where either branch of the service can be ideally efficient without the other. No local county commissioner can secure the permanent results and attain the dignity of which his position is worthy without the wider scope and swing that a close union with the state office will bring to him. Neither can the state commissioner hope to make his efforts result in permanent and broad and lasting effects without the most cordial and immediate response from the county commissioners.

The recent session of the legislature demonstrated the strength that lies in a close cooperative union between the various units of the service. The pressing needs of the interests of horticulture necessitated changes in the organic law governing the matter. Lack of results during previous sessions showed the futility of effort along this line, without a most intimate cooperation among all the different interests directly affected. When these varied units came to an agreement concerning work and effort, the bills agreed upon went through both houses with almost no opposition, and were signed by the Governor. Because of the unifying of the interests, there came to light a bill embodying the best of each interest with the elimination of any feature that might suggest a dissent toward any individual element. Throughout the state a general cooperative movement, deeply concerned in the passage of this bill, gained the confidence of the legislature and impressed the Governor as well, and here we have the results, concerning which we are gathered in this city to discuss and interpret. A closer union carrying a more intimate interdependence will naturally result in a greater efficiency to both the local and the state work. I am pleading for the greater efficiency.

With a closer identification between the state and the county work will come to the county commissioner and his work added dignity, and a recognition of efficiency that will work greatly to the advantage of the county commissioner and prove a great aid in the execution of all the requirements of his office. With it, also, will come a standardization of work throughout the state which will give additional strength to the rulings in individual cases without which recognition, the work must always carry the impress of being localized to a degree that detracts from its strictly judicial character. That is, the work may be petty, rather than broad and comprehensive. In no degree can such an alliance detract from the local importance and local hold of the county commissioner. In every respect there will be added to the local impress that added strength that the state office will impart. It will bring the state commissioner in direct contact with the local board of supervisors, and increase the confidence of the supervisors in the commissioner and the broader aspects of his work. In such a cooperation the local elements take on a more comprehensive nature. There is nothing of local coloring lost, nothing of local popularity lost, and there results a larger influence of state-wide bearing and importance. The state office needs this liberal support. California can not be wisely directed in her numerous and intricate horticultural interests by the state commissioner independent of the local worker. Those vast interests, each year becoming more and more elaborate and complex, require the intimate relation and close cooperation of all these agencies.

California has come to value the general bearing of each local problem and need. It is not sufficient that a county commissioner knows and deals with his own local problems exclusively. The work is being so firmly established on scientific bases, and the solution of problems, however local, has so much of general bearing that it all makes for a more comprehensive understanding on the part of the local agent with every other problem of every other commissioner, and insures the efficiency that is being demanded of this branch of the work. This generalization can best be promoted by the very intimate organization that is the subject of this paper today. While this is true of the county commissioner, the state commissioner can only develop the best within himself and within his office by the cordial support and energizing enthusiasm of the county commissioner. After the county commissioner has demonstrated his ability to master the local problems, thus showing his skill to comprehend the more general ones, he needs the backing of a strong state center, which, on its part, is able to accentuate these local achievements in their relation to the good of the entire state.

This is not an idea confined solely to the minds of county commissioners, but it is a conviction that is rapidly growing in the minds and outlook of the prominent, thinking growers whose interests are so directly connected with the work we are doing in our local fields. Some day it will take shape. If the commissioners themselves are too slow to grasp the situation and mould this developing idea into a coming union of symmetry, based on our actual experience in the fields, in different sections of the state, then the fruit men themselves will formulate a plan, along the lines wherein their own experience have brought them and some scheme for a state department of horticulture will be developed and carried through the legislature in order to standardize the very work with which we are so vitally connected. The wiser course, then, it seems to me, is for this body of county commissioners to inaugurate a definite movement, looking to this very end that there may be a definite plan to present to these earnest fruit growers, based on our best judgment, after carefully considering each local problem, and the final result worked out under the patient cooperation of the state commissioner of horticulture and his able corps of helpers. A closer cooperation, a more vital interdependence between state and county commissioners can have but one tendency and effect, namely: the strengthening and dignifying of both offices.

To so standardize the horticultural work of the state will give to it prestige, dignity and recognition far beyond that to which it can possibly hope to attain under less intimate relations. And to the extent that this is accomplished, will the efficiency and permanency of all that is best in the entire system be conserved and advanced.

STANDARDIZATION OF DECIDUOUS FRUITS.

By C. K. TURNER, County Horticultural Commissioner, Auburn, Cal.

The object of this discussion is, I take it, to bring out the probable effects of the new Standardization Act as compared with the act of 1915, and also the best methods of enforcing the provisions of the law. While I have been asked to speak on this subject as it affects deciduous fruits in particular, some of my remarks will probably apply equally to other branches.

One of the principal differences between Assembly Bill No. 212, which was passed by the legislature in 1917, and the act of 1915 lies in the fact that the standard under the new act applies to fruits intended for sale within the state as well as to interstate shipments; while under the old act the standard applied only to interstate shipments. This change is undoubtedly a step in the right direction since there can be no good reason why we should not protect consumers within our own borders as well as in other states.

Now while, as just suggested, and as part of the title of the act implies, we are trying to protect the consumer, still from a California viewpoint, the central idea is to promote the welfare of our fruit growers. In other words, we are going to be honest and persuade our neighbors to be honest because it pays. The point I want to make, however, is that this change in the law will, if we are to make full use of our orchard products, necessitate the establishment of by-product factories. Even in thoroughly well-tended orchards there is always some cull fruit, unfit for direct consumption, which could be made use of in such factories. The percentage of such fruit is proportionately higher in orchards not so well cared for as those referred to in well cared for orchards. That, of course, opens up a variety of questions as to ways and means of establishing such factories; but I imagine this is not the time or place to attempt these questions.

Section 5 of the new law attempts to define the word "maturity." In the past the shipment of immature fruit has been the cause of much of the low prices obtained for California's deciduous fruits in the East. The reasons being sufficiently obvious to any one who has eaten this kind of fruit expecting to enjoy it. Realizing this condition the legislative committee (with which I had the honor of meeting in Sacramento last winter) spent considerable time trying to arrive at a satisfactory, practicable definition of maturity, finally compromising on the definition as it appears in the act, namely: "the word maturity shall mean a degree of ripeness fit for shipment." This leaves the inspectors in very much the same position as under the act of 1915, since no one will claim that this definition affords much light on the subject. It seemed impossible to find an acceptable definition that would be practicable and could be applied alike to the many different varieties of fruit grown under varying conditions.

In a paper read before the association at Napa last year I made several suggestions for the improvement of the act of 1915 and some of these were adopted by the legislative committee and are now incorporated in the law. Section 15 now takes care of the inspection in counties where the board of supervisors fail to appoint inspectors. The act of 1915 did not explicitly forbid shipping houses to ship or sell fruit which failed to comply with the law; section 19 of the new act takes care of this point. My suggestion regarding maturity was turned down by the legislative committee. This was embodied in a proposed new clause as follows: "All deciduous fruits of the kinds specified in this act, when packed, shall have some of the color of maturity." This met with considerable favor among the growers and shippers in Placer County, but, as stated, it was rejected by the committee as being too drastic and unworkable. Some members raised the question as to how we could handle pears under such a clause. This at first glance appears to be a considerable obstacle, but I contend that while pears can not be said to change color, strictly speaking, at the stage in their development when they will, if picked, ripen into juicy, full-flavored fruit, there is a change in the appearance of the fruit, not easily defined, perhaps best described as a brightening effect from the dull, dead green of absolutely immature fruit. Now as to the difficulty of carrying out such a clause. Have you noticed that the law itself is full of the word "practically"? Can anyone tell me in exact terms what the word means as applied to freedom from insects and fungous diseases, or uniformity in size, quality, etc.? I do not believe the law could be enforced at all except by men of practical experience in the fruit they are called upon to inspect. Such men can be trusted to enforce the law in a practical manner, and would not, for instance, demand that pears be yellow when shipped nor would they ask that any other fruit have the color of complete ripeness. I can imagine myself and the other inspectors of fresh fruits needing as many incarnations as we have shipping or receiving points in order to settle disputes between growers or shippers and inspectors, were we to appoint any but practical men as deputies for this work.

You may, perhaps, think that I am laying over much stress on this maturity question, to the exclusion of other points. However, I consider that the other provisions are comparatively easy to enforce, since violations can be detected immediately upon inspection, and that this is the most important issue and the only one very likely to create a dispute or difference between the inspectors of two or more counties.

At Napa I suggested that provisions should be incorporated in the law looking to uniformity of inspection under the direction of the state commissioner of horticulture. This has been accomplished by the creation of the offices of inspectors in chief in section 13 of the new act, and these officers are directed and empowered to settle such disputes as I have just mentioned. In Placer we shall always be very glad to see either, or both, of our inspectors in chief, even if their decision were against us after they had seen the fruit (they would surely have to see the fruit before they could settle such a dispute). However, I think we can save them a good deal of trouble if the inspectors of fresh fruits from counties between which such differences are likely to arise can meet with the inspectors in chief and try to come to an understanding of just what does constitute a degree of ripeness fit for shipment in some of the most common varieties at least.

MARKETING CANTALOUPES UNDER THE STANDARDIZATION ACT.

By F. W. WAITE, County Horticultural Commissioner, El Centro, Cal.

The act creating standardization of fresh fruits in this state August 8, 1915, was put into effect on the cantaloupe crop of the Imperial Valley in the year 1916, this being the first year after it became a law.

As this season's crop is just beginning to move I will give an outline of how we handled the inspection last year. It has been proven that where the law was enforced last year much good was done. Realizing that laws are of no effect unless enforced I decided to use the authority vested in me and do my duty to the best of my ability.

This being the first time a law was to be enforced on the packing and shipping of cantaloupes there were many things to be considered and in order to get all parties interested in and acquainted with the law I decided to call a meeting of the shippers and distributers and give them an opportunity to state their side of the case. I wrote letters to all the distributers of cantaloupes outlining my views with the idea of getting all parties to meet in conference and agree to cooperate. The replies to this letter were very encouraging and with the exception of one, all were willing to cooperate. They expressed a desire to have a meeting to go over the requirements of the law and agree on plans of procedure. At the first meeting called by this department nearly all the distributers were represented. Each section of the law pertaining to cantaloupes was gone over carefully and free discussion was allowed until the subject was understood and an agreement reached. There were several reasons why it semed necessary to have the shippers agree on the method of inspection. One of the main reasons was because of the difficulty in knowing a mature melon. The act reads it shall be mature. Experienced melon men sometimes do not agree on a melon being mature and are often mistaken upon the examination of it, therefore, it is a difficult subject and most important to the industry. In order to handle the "mature" subject it was agreed to pick all melons on the full slip; that is, when the stem parts from the melon freely with a slight pressure of the thumb, leaving a smooth cavity. This plan was used by most of the shippers throughout the entire season. It is true that in many cases reports came back from the East "Melons overripe," yet the prices held good.

The most important fact about shipping melons too ripe is that by so doing one can not deceive the public and the loser is the grower, but a green melon is the one that does the damage as it gets into the hands of the consumer and is very disappointing thereby lessening the demand and causing a poor market. The main cause for trouble in picking green, not full-slip, melons lies in the fact that the stem is broken off and the ripeness is judged by the looks. The pickers are apt to get away from maturity and melons are brought into the packing sheds too green. Picking and packing is done mostly by contract; naturally no one wants to lose, consequently many melons are likely to be packed green. If there are plenty of pickers to keep up with the packers it is possible to continue on the full slip, but it is difficult to get pickers enough during the height of the season.

One of the most important reasons for growers agreeing or cooperating is that they might decide as to the disposition of melons that have been condemned on account of not being fit for shipment. The law says they shall not be shipped, but what shall be done with them? In the past there was trouble over the rejected melons which were condemned by the inspector. The growers would sell them to brokers on the street, who would ship them, thus causing damage to the market. We agreed to hold them for 24 hours and then release to the grower. This plan was not successful as the crates would be carried away in the night, and some parties not connected with the industry even attempted to ship by express. It would be impossible to retain rejected melons on the platform on account of lack of room. It was finally agreed to turn over all condemned melons to a transfer man, who fed them to hogs. It was further agreed that the head inspector of each shipping company be appointed horticultural inspector, giving him authority to act under the state law. All the cost of inspection in 1916 was paid by the distributers and the growers. The law was put into operation on May 7, by condemning and destroying seven crates of green melons. Orders were given the shippers that express shipments must be on the platform in time to be inspected before the arrival of the train, or the same would be held over. It was necessary to condemn many crates of melons in the beginning of the season until some of the growers had learned the requirements. There were nearly nine thousand crates condemned by the railroad platform inspectors, to say nothing of the number thrown out by the field inspectors at the packing sheds.

The law of 1915 has proven of great benefit and I am glad that the amendment of 1917 has enlarged its scope and has given inspectors more authority and allows closer inspection. I am in favor of enlarging it still more and taking in all the products of the farm offered for sale anywhere in the state or shipped out of the state. I am thankful for the improvement this year, but will be glad to have the facts more plainly stated as to the requirement and disposition of condemned products, also more complete definition of the word "maturity" in the shipment of cantaloupes; at the same time allowing all products to be sold or shipped that are mature and fit for sale. I suggested to Mr. Ashley to add at the head of the bill after "fresh fruits and all farm products, herein mentioned," other products from time to time. I am pleased to note that tomatoes have been added. The great per cent of producers and shippers know that it pays to put up a good pack, possessing uniformity and maturity; but the other per cent "butt in" and make it necessary for the inspectors to compel them to do likewise in order to keep a profitable market. For the growers or producers it is a matter of education which sometimes has to be paid for by dear experiences. In other words, the packers have to have a direct loss by having a product condemned and destroyed before they learn this lesson well.

Before the season opened this year I called a meeting of the distributers and went over the laws as amended, all present agreeing to pick on a full slip and abide by the decision of this department. It is very gratifying to note that this year's law states that melons shall be fully netted and of uniform size, firm and mature, free from bruises and practically free from aphis honey dew or other defects. Even with the increased acreage, with closer inspection, and shipping only first-class melons the market will not be destroyed. Keeping all imperfect melons from being shipped makes the market demands stronger, besides saving the cost of shipping inferior stuff which ruins the market and causes a loss to the industry.

I make the prediction that before long all products offered for sale or shipped will be standardized.

GRAPE STANDARDIZATION.

By A. L. RUTHERFORD, County Horticultural Commissioner, Modesto, Cal.

Many years ago when fresh grapes were shipped to eastern markets remunerative prices were obtained. The grapes were of fine quality and much care was exercised in the packing. These good prices stimulated planting, so with each year large acreages were added to the industry, until the market became somewhat overstocked. Prices began to decline and this caused growers and packers to become less careful in both the growth of fruit and in the pack. So the business went from bad to worse until the railroads and packers were getting all that was to be made. The packers were getting their price for packing, and the railroads were charging the same freight, so they kept encouraging the growers to continue picking and delivering to the packing houses, even though the growers were not getting pay for the hauling.

During this time of general bankruptcy there were a few farmers who had not lost the art of putting good, clean fruit on the market, and they continued to receive prices that justified the expense and trouble. The prices which these people obtained were held up to the rank and file of growers to encourage more shipments.

At last the time came when the fresh grape shipments would have to cease, or the growers would have to assign, and it was not until then that growers attempted to help themselves. Committees of investigators were sent out to see what might be done. These investigators developed the fact that good ripe fruit was yet commanding good prices, so it was decided that only clean, ripe fruit should be shipped. Then it was that our farmer legislators in 1914 got their heads together, framed and passed a standardization law to control the quality of fruit shipped. This law, although somewhat lame, did wonders towards restoring profitable prices. Two parts of the section of the law provide that all fruit shipped must be practically free from insects and fungous diseases, and that grapes shall show at least 16 and 17 per cent Balling scale. These are the main features of the law of benefit to the fruit grower.

In 1915, when the law became operative, it was quite a serious problem with the different horticultural commissioners to determine just how to proceed. I put my machinery to work, then slipped down to Fresno, then to San Joaquin County to see if my system of inspection could be improved, but, to my surprise, I found both Fresno and San Joaquin doing just as I had planned. The task was so expensive, with insufficient money available, that it was out of the question to put an inspector at each of the packing houses. So the next best thing was done, that was for the inspectors to visit each packing house one or more times a day, as the demand might require, and not at any particular hour. Often two inspectors would have overlapping territory, so the packers would not know where or when to look for an inspector. Then the commissioner made it a point to visit each packing house every other day, if not oftener. The commissioner and each inspector was provided with a Balling scale testing outfit, and these were used whenever there was any suspicion of the fruit not being up to the required test. Mildew and insect diseases were carefully looked after.

The word "practically" in the sentence (practically free from insect and fungous diseases) was the cause of much discussion. The packer would insist that where there was but a slight infestation of mildew the grapes were practically free, and again, the packers would put up two grades for shipment, one for local and the other for foreign or interstate shipment, so it was not always possible to know just where the grapes were to be shipped.

Most packing firms and the packers took pride in putting out a clean, fancy pack. There were others who only cared to get out quantity, and not until a few packed cars were turned down and threats made of arrest did these packers come to understand that their packs must conform to the requirements of the standardization law in every possible way.

During the season of 1916 there was a decided improvement over the pack of 1915, due to the growers using greater effort to subdue the mildew, waterberries, and prohibiting the gathering of underripe fruit. And most all packers had learned that it was to their interests, as well as to the interests of the growers, to send forward honest packs. Consequently, last year it required less vigilance, on the part of the inspectors to obtain a better pack.

During the past session of the legislature the promoters of the first standardization law, with the State Commission of Horticulture, and the different horticultural organizations framed and passed an amendment to the law, which our good Governor has seen fit to sign. This law, relative to grape shipments, affords some improvement, opens the way to produce splendid results, and promises the restoration of early-day prices to the grape grower.

Standardization and organization is the keynote of prosperity to the farmer and the fruit grower. Let the good work go on.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF MAY, 1917.

By Frederick Maskew.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	70
Passengers arriving from fruit fly ports	3,665

Horticultural imports:	Parcels
Passed as free from pests	115,286
Fumigated	2,131
Sterilized with steam	1,680
Refused admittance	108
Contraband destroyed	40
Total parcels horticultural imports for the month	119,245

Pests Intercepted.

From Australia (Victoria):

Venturia pyrina on fruit of pears.
Rhizoctonia. Fusarium, Oospores scabies and *Phthorimaea operculella* on potatoes.

From China:

Fungus on oranges.
Calandra oryzæ in rice.
Lepidopterous larvæ in dry herbs.
Coccid sp. on plants.
Hemichionaspis sp. on lichee trees.

From Hawaii:

Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Chrysomphalus sp., *Parlatoria* sp., *Pseudococcus* sp., and Cicada eggs on palm.
Pseudococcus sp. on plant.
Larvæ of *Dacus cucurbitæ* in cucumbers.

From Japan:

Gymnosporangium joponicum on junipers.
Mite in bulbs.
Larvæ of weevil in chestnuts.
Larvæ of weevil in sweet potatoes.
Pulvinaria sp., *Hemichionaspis aspidistræ* and *Lepidosphes* sp. on citrus cuttings.
Poliaspis pini on pine tree.
Fungus on citrus fruit.

From Mexico:

Calandra sp. in various seeds.
Lepidopterous larvæ in seeds.
Lepidosaphes beckii on limes.
Chloridea obsoleta in tomatoes.

From New Jersey:

Diaspis boisduvalii and *Isosoma cattleyæ* on orchids.

From Panama:

Lepidopterous pupæ on orchids.

From Papeete:

Morganella maskelli, *Lepidosaphes beckii* and fungus on oranges.

From Pennsylvania:

Dialeurodes citri and *Coccus hesperidum* on citrus trees.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	22

Horticultural imports:

	Parcels
Passed as free from pests	81,692½
Fumigated	3
Refused admittance	4¼
Contraband destroyed	5
Total parcels horticultural imports for the month	81,704¾

Pests Intercepted.

From Mexico:

Chloridea obsoleta in tomatoes.
Weevils in tamarinds.

From Pennsylvania:

Coccus hemispherica on gardenias.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	21
Fishboats inspected	28
Passengers arriving from fruitfly ports	90

Horticultural imports:

	Parcels
Passed as free from pests	3,538¾
Fumigated	5
Refused admittance	3¼
Contraband destroyed	3
Total parcels horticultural imports for the month	3,550

Pests Intercepted.

From Illnois:

Aspidiotus lataniæ and *Saissetia oleæ* on ornamentals.

From Mexico:

Lepidosaphes beckii on lemons.

From New York:

(*Lixus concavus?*) borer in rhubarb roots.

From Ohio:

Pseudococcus sp. and *Orthezia* sp. on ornamentals.

From Oregon:

Rhizoctonia and common scab on potatoes.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	5

Horticultural imports:

	Parcels
Passed as free from pects	20

SANTA BARBARA STATION.

(No report.)

O

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OF THE

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GOVERNOR WILLIAM D. STEPHENS, in his home garden, planted and cultivated by himself.

Honorable DAVID F. HOUSTON, Secretary of Agriculture.

THE MONTHLY BULLETIN.

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VI. September, 1917. No. 9.

SECRETARY OF AGRICULTURE HOUSTON TELEGRAPHS MESSAGE TO CALIFORNIA FARMERS.

Hon. G. H. Hecke,
State Commissioner of Horticulture,
Sacramento, California.

The farmers of California, as well as those of other states of the Union, have responded very generously to the appeals for increased production. They have recognized the fact that an abundance of food is essential to the successful prosecution of the conflict for the defense of our rights and the safeguarding of Democracy. We must supply our own needs, including those of the troops who will fight our battles, and must endeavor to meet in part the need of those nations with which we are cooperating. I am sure that the farmers of the country realize how much the nation depends upon them and that their patriotism will stimulate them to still greater efforts. Next year the problem of conservation will be particularly urgent. Just now it is of the first importance that the surplus fruits and vegetables which have been or are being produced this year shall be conserved. They must be consumed locally to as large an extent as possible, thereby lessening the drain on our store of perishable staples and relieving the pressure upon our transportation facilities. The Department of Agriculture desires to enlist the aid of every agency in the campaign to insure the conservation of surplus fruits and vegetables.

D. F. Houston, Secretary.

STATE COUNCIL OF DEFENSE.

By A. H. NAFTZGER, Vice Chairman, State Council of Defense.

When our participation in the world-wide war became inevitable, Governor Stephens, who had been for years an earnest advocate of preparedness, began the work of putting California in the best condition to bear her part in the struggle. At his request the legislature passed an act creating the State Council of Defense, and it so happened that war was declared by Congress on April 5 and on the following day the State Council of Defense was organized and immediately began activity in many directions.

Briefly stated, the purpose for which the council was created was to take into consideration all matters, affecting the welfare and safety of the people of California, occasioned by war.

The first urgent matter to which the council of defense gave its attention was that of increased food production, because food is very likely to determine the outcome of this war. Everything possible, therefore, was done to stimulate more planting, especially of beans, rice and potatoes, articles which are all of prime importance in supplying the requirements of our allies and the neutral countries. Other subjects were promptly taken up by committees appointed for the purpose, and many questions affecting the welfare of the people have been given careful attention, such, for instance, as the protection of power plants, dams, flumes, tunnels, bridges, etc.; the protection of property, especially grainfields, warehouses and mills, from destruction by fire; increase of forage for producing meat; methods of curing and saving the fruits and vegetables by drying and canning, and many other similar questions.

All of this time the food question, especially as to breadstuffs, rice, sugar and beans, has been of overshadowing importance, and the State Council of Defense has engaged in a state-wide propaganda, not only for the greater production of these staples, but for conservation and the minimizing of waste in the use of food.

Closely related to the food question is that of farm labor. This is of vital issue all over the United States, as there is everywhere a shortage of farm help. This is due to various causes. Many thousands of foreigners have been called home to fight, and immigration into our country has ceased. Manufacturing and other industries, such as railroading, lumbering, etc., have made heavy demands for labor at increased wages. The farm is the last place that men are willing to work. In addition to all these other causes the calling of the National Guard into service and the demand for men in the Army and Navy, and finally the conscription, have all tended to take men from the farms, if not directly, then indirectly, for the man that is taken into military service leaves an opening for some other man, and finally the man from the farm fills the gap.

Much time and considerable money have been devoted to the cause of farm labor by the State Council of Defense, through its committee and directly. Thousands of high school boys have been mobilized for farm work, especially for fruit harvesting.

One of the most important accomplishments of the State Council of Defense has been the creation of the county councils of defense in all counties of California. Through this medium the work has been carried directly to the people and its importance pressed upon them. Space does not permit detailed statement of what has been accomplished through the county councils of defense. First of all has been the maintenance of quiet and good order among the people, and a restraining influence has been exercised against such as sympathize with our enemy in this war, and then all the other many questions that directly affect the people under war conditions have had the attention of the county councils of defense.

The one great central vital issue in this republic today is the building of the nation into a gigantic war machine, and around this central issue will cluster the coordinate activities, two of which will probably remain conspicuous in importance, the production and conservation of food and the mobilizing of all of the people for patriotic service. This war is to make tremendous drafts upon our people and upon our material resources.

Great numbers of men must go to the front. All the people must be brought to realize that these men at the front must be supported, fully, completely, in every way, and then huge sums of money and vast quantities of everything else will be required to fight this war to a successful issue. Back of it all is the real question—whether this world is to be safe for free, self-governing people, or whether it is to be ruled by self-constituted autocrats. The State Council of Defense is one of the mediums, perhaps the chief organized force, through which the people of California are to coordinate their forces, stimulate their activities, concentrate their powers in one unified effort for the overthrowing of despotism, and the permanent establishment of free government over the world.

WHAT CROPS?

By THOMAS FORSYTH HUNT, Dean of the College of Agriculture and Director of the Experiment Station, Berkeley, California.

In October, 1914, the University of California Agricultural Experiment Station published a circular entitled "Some Things a Prospective Settler Should Know," in which, incidentally, were given the low, high, and average California prices of the staple agricultural and horticultural crops. The world was even then at war.

The high price for wheat was $1.66 per cental. In the case of barley and potatoes, $1.50 per cental was considered a high price. For rough rice $3.00, and for beans $5.00 per cental was as much as any one expected. Onions were recognized to fluctuate greatly, the high price being stated as $2.00 per sack, the average 80 cents, while 50 cents was recognized as a low price which might be expected to occur whenever onions were especially abundant. In the case of fruits, a high price per ton during the years preceding 1914 had been: Muscat raisins $100, shipping grapes $60, dried prunes $120, dried peaches $200, dried apricots $300, and green pears $60. Forty cents per pound was a high price for a dairyman to receive for his butter fat and $12 per ton was a high price for him to pay for alfalfa.

Much is being written these days about relative food values. Naturally, this has caused considerable discussion about the future of certain characteristically Californian crops. This article is not written with the purpose of forecasting the future or giving any advice concerning the substitution of one crop for another, but rather for the purpose of trying to illustrate the difficulties encountered in attempting to advise, and to call attention to the fact that many wild statements are going the rounds.

In the circular above mentioned there were published the average, probable and possible yields of the leading crops raised in California. In this table there is one column which gives what is estimated to be a safe yield for business purposes. It is assumed to be 50 per cent greater than the average state yield, and probably only three-fourths the yield which an experienced farmer might hope to obtain under normally favorable conditions. These data so far as they relate to crops entering into human consumption are reproduced in the first column of the table below:

Table Showing the Total Farm Products as Sold, the Fresh Portion as Normally Used for Human Food, and the Total Dry Matter Contained in the Edible Portion, Based on the Estimated Safe Yield in California. (The figures are not official.)

Products	Merchantable product as normally sold, pounds per acre	Portion utilized as human food			
		Description	Per cent	Pounds per acre	Dry matter, pounds per acre
Sugar beets	26,000	Sugar	15	3,900	3,900
Prunes, dried	3,500	Pitted	86.5	3,028	2,492
Grapes, shipping	10,000	Including seeds and skin	95	9,500	2,147
Potatoes	10,500	Peeled	85	8,925	1,841
Apples	13,500	Cored and peeled	86	11,610	1,788
Onions	15,000	Peeled	90	13,500	1,674
Oranges	16,300	Peeled	73	11,900	1,559
Plums, shipping	7,350	Pitted	96	7,056	1,524
Pears, shipping	10,000	Cored and peeled	93	9,300	1,451
Apricots, dried	2,000			2,000	1,412
Peaches, dried	2,000			2,000	1,388
Rice	2,200	Polished	60	1,320	1,158
Beans	1,200			1,200	1,062
Raisins—muscats	1,500		90	1,350	1,012
Olives, ripe	3,000	Pitted	81	2,430	858
Oats	1,440	Rolled oats	60	864	801
Barley	2,000	Flour	45	900	794
Wheat	1,200	Flour	72	864	760
Cherries	4,000	Stemmed and pitted	89	3,560	680
Lemons	18,900	Juice only	35	6,615	662
Almonds	1,000		50	500	475
Walnuts	1,000		42	420	410

Notes.

In the absence of satisfactory data, estimates have been made in the following items:

Barley Flour. We believe that you should use the figure that we gave you for barley flour (45%), as that represents the maximum amount of human food material or barley flour that we have been able to produce from the whole barley (Sperry Flour Co.).

Potatoes. Atwater's data gives 80% edible; 85% seems better.

Lemons. Estimate of juice only (Colby, 35%). Lemon juice (Atwater) is 2.3% sugar, 7.5% citric acid, edible 9.8%. 10% dry matter used in table.

Grapes. (Bioletti) 95% edible.

Prunes. (Colby) 86.5% edible.

Plums. Howard states shipping crates contain 20 to 22 pounds. An average of 21 used in the calculations, making an acre yield 7,350.

Howard's estimate of edible portion 97.5 to 98%. Our own figures from a small number of two varieties, 94.0 and 97%. Used in table, 96%.

Pears. Atwater's figure, 90%; Howard's figure, 95%; average 93%, used in the table.

Cherries. Our own and Howard's figures agree to 89% edible.

Walnuts. (Atwater) 42% edible.

Almonds. (Taylor) 50% edible.

The data in the first column need not be accepted as final. At best they are only estimates. If they are 50 per cent too high, or equally low, then the data in the last two columns are also. In any case it is believed that the figures are comparable.

Certain important crops have been omitted from the table because they are not directly the source of human food. Some of these, however, are indirectly quite important. For example, True reports that in feeding investigations at the University Farm, the average production of four cows during seven periods of lactation when fed exclusively on alfalfa was 1,167.7 pounds of milk per ton. By actual analysis the total solids were 12.8 per cent, or 149.1 pounds, and 4.13 per cent of butter fat, or 48.3 pounds. On the basis of five tons of alfalfa per acre, the acre yield of dry matter in the milk would be 745.5 pounds, while the acre yield of butter fat would be 241.5 pounds. In times of great scarcity of food the consumption of the whole milk would tend to relieve the situation, although the cost of distribution would need to be considered, and might be impossible of economic adjustment. Incidentally, in these times of high prices for protein (meats), fat and sugar, all contained in milk in the highest edible form, milk should receive most careful consideration in making up the family dietary.

There is no common denominator by which the relative values of these foods for human consumption can be accurately stated. However, assuming the usual mixed diet for an American family, the total amount of dry matter is sufficiently accurate for the purpose of determining the ability of a given food to sustain a population during war times. No account is here taken of personal tastes, which, except under a forced ration, are an important consideration. All investigations tend to show that the greater the variety of foods one consumes the better will be his nourishment. A satisfactory diet should include the five great classes of foods, viz: (1) meats, (2) fats, (3) cereals, (4) fruits and vegetables, and (5) sugar. Under such conditions, it is not necessary to make too close reference to the calories, protein, vitamines, carbohydrates, or mineral matter, confessedly important as these are in themselves.

There lies before me as I write a table giving the amount of protein, fat, carbohydrates, and mineral matter per acre in each of these crops. There is nothing particularly significant in the data, except, perhaps, that the cereals and beans produce higher amounts of protein and, as consumed, less fiber than the fruits, and that olives, almonds and walnuts produce notable amounts of highly valuable fats per acre. The further data in this table submitted herewith have been prepared by Mattill, after examining existing data, conferring with other members of the staff, and after making some independent investigations. Subsequently the data have been submitted to each member of the Staff of the College of Agriculture and thus have had the benefit of the criticism and judgment of more than 150 persons.

The reader will doubtless be able to arrive at his own conclusions from the data submitted. He will recognize that while only 72 per cent of wheat is converted into flour, the remaining 28 per cent constitutes a highly valuable food product for domestic animals. On the other hand, the by-products of wheat pay only approximately for the cost and profit of milling. This statement is, of course, dependent somewhat on the relative prices of wheat, flour and the by-products. He will also note that the by-products of oats are less valuable than those of wheat.

The growing of potatoes and other vegetables is recognized as a ready means by which the food supply can be increased. It is not so fully recognized that a too great dependence upon them may lead, and indeed has led, in other countries, to famine, because they are frequently subject to crop failure. A production beyond current needs often entails loss, since they can not be carried over into another year without a prohibitive expense. Cereals are held in elevators indefinitely, meats may be permitted to increase in the growing animals within certain limits, but potatoes, onions, cantaloupes and fruits are subject to decay. Few, perhaps, recognize the enormous benefit of the canning industry in stabilizing the food supply. A country which depends chiefly upon cereals and meats can not be as densely populated as the one which depends more largely upon vegetables and fruits, but it is less exposed to extremes in its food supply.

It is, of course, well recognized when land is cheap and labor dear that extensive agriculture is practiced, which means relatively small yields per acre and large yields per unit of labor. When land becomes dear and labor cheap, the intensive agriculture is practiced, which has meant, in the past at least, larger yields of food per acre and less yield per unit of labor. The claim is not made that this must necessarily be, but that it has been.

Neither of these conditions exist now, since both land and labor are dear. What is the answer under these new conditions? It is safe to say that no one can foretell. Doubtless, if the war continues for several years, it will be found necessary to raise those crops which give the greatest return per unit of labor, or to devise means for producing existing crops with less human effort.

If it becomes necessary on account of the unprecedented demand for human labor to reduce those foods which require the most labor per unit of food value, the net result will be a decrease in the total food supply and hence there will be less food per capita. On the other hand, this very fact will tend to increase the demand, and in turn tend to prevent the decrease in the cultivation of intensive crops.

All of this, of course, is for the future. As long as the government is issuing liberty bonds there will be an abundance of money in the hands of the consumer. A nation, as well as an individual, usually lives extravagantly when it is not compelled to live on its current income. As long as the consumer has money he will buy food freely. No criticism is intended in any of these statements. The purpose is only to recognize the fact.

To the man who likes specific formulæ or who believes in governmental rules and regulations, this will be a disappointing article. It is safe to say, the more one studies the table herewith presented, the less he will care to have the responsibility of ordering what crops should or should not be raised. Some of us would like to control the weather, but we would probably "muss" things up a bit if we were so unfortunate as to have the opportunity. It is quite old fashioned these days to speak of the law of supply and demand. Nevertheless, farmers will probably be compelled to allow this unpopular and much maligned "dictator" to determine for them largely the direction in which they will travel in developing the crop acreages in California.

HOW ORGANIZATION OF PRODUCERS AFFECTS PRICES.

By HARRIS WEINSTOCK, State Market Director, San Francisco.

Following close on the heels of America's entry into the world war came a nation-wide stimulus to increased production of foodstuffs—a stimulus that was unwisely applied, without discrimination and without forethought in respect to what would happen when harvest had succeeded springtime. Now, of course, we have the inevitable result: with an unprecedented demand for certain products suitable for overseas consumption, the markets have been glutted with other, and more perishable, products which must be consumed locally or not at all.

Take onions as a typical example. They are a quick and easy crop to raise; therefore California responded largely to the patriotic stimulus to plant onions—not wisely but too many. As a result, the early crop matured and was quickly harvested to make room for a second crop of something else. This early crop came to market all at once and, since our people will eat only so many onions and no more (regardless of price), they went begging at a price below the cost of production.

Then—but not until then—the State Market Director was called in to solve the problem, but it was not soluble. These early onions could not be shipped to other states, for they also had been stimulated to overproduction. They could not be stored, because the first crop is poor in keeping quality. The utmost that could be done would be to evaporate them and market them in a dried state.

Fortunately, I was able to enlist two systems for dehydrating onions—on the simple condition that a market for the evaporated product, at a small manufacturing profit, could be found. By letters and telegrams this outlet was immediately sought, but there was no outlet. It seemed logical that the United States Navy, already in foreign waters, would welcome an opportunity to secure evaporated California onions; that the thousands of men being silently sent to join Pershing in France would take into the trenches the onions from which nine-tenths of the weight had been evaporated, with no loss of flavor or food value; and that part of the armies of Europe would jump at the chance of securing this unique food supply.

As the State Market Director, I left no stone unturned to bring about this desirable consummation. I placed the matter before the commissary departments of the United States Army and Navy, both in California and Washington, D. C.; and I telegraphed the purchasing agents of each of our allied nations. What was the result? Our own country was not interested, because onions in a fresh condition were everywhere available for both the Army and Navy. Not a single foreign country could give an encouraging reply, for even Belgium and France reported a plentiful crop of fresh onions.

Now, what is the lesson of this experience of the onion growers? As I interpret it, it is this: That lack of organization spells chaos, immediate loss to the producer and ultimate expense to the consumer. The farmers who this year produced onions at a loss will not plant them next year—with the result that lowered production and abnormal prices will again be the rule.

The onion growers of California have never been organized. They plant indiscriminately and market as individuals—as do the growers of most vegetable products. Result: at times the consumer is begged to take onions at less than one cent a pound, and at other times is required to pay 15 cents a pound.

This fluctuation has not happened in the case of a single farming or fruit industry that has organized for collective marketing. Both the producer and the consumer have been benefited as the result of pooling the output, standardizing and grading the pack, and reducing speculation to a minimum. The proof of this is the fact that in the face of the most determined opposition to the organizing activities of the State Market Director, the last legislature passed a new act to authorize the extension of such activity, and Governor Stephens added his approval by reappointing the State Market Director.

As an individual, the producer is helpless, and not even the state can be of much service. He is at the mercy of a shifting market, but the consumer does not reap the logical benefit. The organized producers, on the other hand, are being assisted and guided by the state at every turn, whenever perplexing conditions present themselves.

And what is the result? The organized producers are getting fair prices and the unorganized are losing all along the line. Meanwhile, the consumers are buying the standardized and graded products of organized growers at reasonable prices, while at times paying extortionate prices for unorganized products, such as onions.

The recent abnormal price of onions, for example, due mainly to spasmodic planting by unorganized growers, had of course the immediate effect of stimulating everybody to plant onions. Had the growers been organized, they would have known that they were overplanting and would have kept their acreage within reasonable bounds. Organized consumers learn that overproduction, with disastrous prices, is logically followed by underproduction and high prices to the consumer. In their own interest, the producers object to abnormal prices because these in turn bring on another season of overproduction. By getting together and accumulating accurate information, they are able to plant intelligently, equalize production from year to year and steady the market to such an extent that the consumer will not be at the mercy of the fluctuating prices of speculators.

The man, whether producer or consumer, who can not read the answer is a poor reader.

CROP REPORT AND STATISTICS.

MONTHLY CROP REPORT.

(August 1, 1917.)

By Geo. P. Weldon.

Compiled from reports of the county horticultural commissioners.

Counties	Almonds (per cent)	Apples (per cent)	Apricots (per cent)	Berries (per cent)	Cherries (per cent)	Figs (per cent)	Lemons (per cent)	Olives (per cent)	Oranges (per cent)	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)	Grapefruit (per cent)
Alameda	40	50	h	100	h	#	#	#	#	60	80	50	30	100	#
Butte	15	20	#	—	h	100	—	65	25	28	20	55	60	#	25
Colusa	85	—	h	#	#	100	—	#	—	#	100	100	110	100	#
Contra Costa	70	90	h	#	h	#	#	#	#	100	70	40	90	100	#
El Dorado	#	70	#	#	h	#	#	#	#	80	85	80	90	#	#
Fresno	#	#	h	h	#	100	—	100	40	90	#	#	#	#	#
Glenn	70	90	—	—	#	#	15	70	15	80	#	#	80	#	#
Humboldt	#	80	#	90	h	#	#	#	#	90	90	#	—	#	#
Imperial[1]	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Inyo	#	65	#	#	#	#	—	-	#	0	0	#	#	#	#
Kern	#	100	h	#	#	#	#	#	50	55	100	75	100	#	#
Kings	#	#	h	#	#	#	#	#	#	95	#	#	100	#	#
Lake	70	100	#	#	#	#	#	#	#	—	100	#	100	#	#
Los Angeles	45	85	h	65	#	75	50	25	50	100	80	80	#	95	75
Madera	80	—	h	—	#	100	#	65	#	120	#	h	80	#	#
Marin	#	40	h	h	#	#	#	#	#	80	90	#	80	#	#
Mendocino	#	100	#	#	#	#	#	#	#	#	100	#	100	#	#
Merced	90	#	h	#	#	100	#	100	#	100	#	#	#	#	#
Modoc	#	95	#	#	#	#	#	#	#	#	#	#	#	#	#
Monterey	60	75	h	65	h	#	#	#	#	90	90	70	80	#	#
Napa[2]	40	80	h	h	h	#	#	#	#	90	110	70	100	#	#
Nevada	#	80	0	100	h	#	#	#	#	60	100	75	#	#	#
Orange	#	90	h	75	#	#	70	#	80	100	#	#	#	70	#
Placer	75	70	#	h	—	—	#	75	50	70	60	35	#	#	#
Riverside	26	85	h	#	h	#	25	30	13	78	70	#	85	#	78
Sacramento	60	100	h	100	h	#	—	50	25	105	120	100	90	#	#
San Benito*	90	100	h	100	h	#	#	#	#	100	100	#	75	#	#
San Bernardino	#	95	h	75	h	#	10	35	20	100	#	#	#	75	75
San Diego	#	90	10	50	#	#	60	40	55	55	90	#	#	#	90
San Joaquin	100	#	h	#	h	#	#	—	#	100	90	100	100	75	#
San Luis Obispo	60	60	80	#	#	#	#	#	#	55	40	#	75	#	#
Santa Barbara	#	100	h	#	h	#	60	70	90	#	#	#	#	115	100
Santa Clara	#	90	h	100	h	#	#	#	#	80	65	72	72	#	#
Santa Cruz	#	100	h	85	h	#	80	#	#	80	90	—	95	#	#
Shasta	20	50	#	h	#	#	#	50	#	50	75	#	70	#	#
Siskiyou	#	80	#	h	h	#	#	#	#	80	90	95	#	#	#
Solano[3]	10	#	h	—	h	#	#	#	#	75	100	75	75	#	#
Sonoma	#	80	h	100	h	—	#	—	#	90	90	75	70	70	#
Stanislaus	100	#	h	100	h	110	#	#	40	100	70	#	#	#	#
Sutter	65	100	—	h	h	60	#	70	#	85	100	100	100	#	#
Tehama	50	80	h	h	#	100	#	50	25	75	50	100	90	#	#
Tulare	#	#	h	h	#	100	95	65	65	100	#	95	100	#	80
Ventura	#	#	h	#	#	#	10	#	15	#	#	#	#	75	#
Yolo	50	75	h	—	#	80	#	75	#	60	75	80	90	#	#
Yuba	70	90	#	75	#	90	#	80	90	70	100	75	#	#	#
State average	59	90	-----	-----	-----	97	39	45	39	88	87	57	76	83	-----

Figures indicate condition of crop in per cent on the basis of 100 as normal.
—Horticultural commissioner has insufficient information for a report.
#Not grown commercially.

[1] No report received.
[2] Report by H. J. Baade, Farm Advisor.
[3] Report by J. W. Mills, Farm Advisor.
*Same report as previous month.
h—Harvested.

Estimated Per Cent of the Total Crop of the Principal California Fruits Grown in Each of the Main Producing Counties During a Season of Normal Production.

Compiled from reports of the county horticultural commissioners, 1915.

Counties	Almonds (per cent)	Apples (per cent)	Apricots (per cent)	Cherries (per cent)	Figs (per cent)	Lemons (per cent)	Olives (per cent)	Oranges (per cent)	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	*	*	11	9	#	#	#	#	*	2	*	*	#
Butte	12	*	#	*	3	#	14	*	3	2	*	2	#
Colusa	4	#	*	#	#	#	#	#	*	*	#	*	#
Contra Costa	11	*	*	*	#	#	#	#	*	6	*	*	#
El Dorado	#	*	#	*	#	#	#	#	*	3	*	*	#
Fresno	#	#	5	#	53	*	3	*	29	#	#	*	#
Glenn	*	*	*	#	#	*	*	*	*	#	#	*	#
Humboldt	#	2	#	*	#	#	#	#	*	*	#	*	#
Imperial	#	#	*	#	*	#	#	#	#	#	#	#	#
Inyo	#	*	#	#	#	#	#	#	*	#	#	#	#
Kern	#	*	*	#	#	#	#	*	*	*	*	*	#
Kings	#	#	5	#	#	#	#	#	6	#	#	*	#
Lake	*	*	#	#	#	#	#	#	*	8	#	*	#
Los Angeles	2	2	4	#	*	31	14	26	4	*	3	#	30
Madera	*	*	*	#	3	#	2	#	*	#	#	*	#
Marin	#	*	*	#	#	#	#	#	*	*	*	*	#
Mendocino	#	*	#	#	#	#	#	#	#	*	#	*	#
Merced	*	#	*	#	9	#	*	#	3	#	#	#	#
Modoc	#	*	#	#	#	#	#	#	#	#	#	#	#
Monterey	*	12	2	*	#	#	#	#	*	*	*	*	#
Napa	*	*	*	*	#	#	*	#	*	4	*	4	#
Nevada	#	3	*	*	#	#	#	#	*	*	*	#	#
Orange	#	*	4	#	#	7	#	10	*	#	#	#	38
Placer	*	*	2	3	*	#	*	*	6	7	39	#	#
Riverside	3	*	7	*	#	16	11	14	*	*	#	*	#
Sacramento	6	*	*	5	#	*	5	*	*	18	8	*	#
San Benito	*	#	6	*	#	#	#	#	*	*	#	3	#
San Bernardino	#	4	4	*	#	13	7	31	5	#	#	#	2
San Diego	#	*	*	#	#	10	5	*	*	*	#	#	*
San Joaquin	12	#	3	25	#	#	4	#	8	4	*	*	*
San Luis Obispo	*	*	*	#	#	#	#	#	*	*	#	*	#
Santa Barbara	#	*	*	2	#	*	2	*	#	#	#	#	10
Santa Clara	#		21	26	#	#	#	#	5	9	18	55	#
Santa Cruz	#	51	3	2	#	#	#	#	*	*	*	*	#
Shasta	*	*	#	#	#	#	*	#	*	*	#	*	#
Siskiyou	#	*	#	*	#	#	#	#	*	*	*	#	#
Solano	6	#	3	10	#	#	#	#	3	6	16	4	#
Sonoma	#	16	*	9	*	#	5	#	*	6	*	12	*
Stanislaus	6	#	*	*	5	#	#	*	3	*	#	#	#
Sutter	9	*	*	*	3	#	*	#	2	*	*	*	#
Tehama	*	*	*	#	*	#	11	*	*	2	*	*	#
Tulare	#	#	*	#	6	5	6	13	9	#	2	4	#
Ventura	#	#	6	#	#	15	#	2	#	#	#	#	20
Yolo	11	#	5	#	5	#	3	#	2	9	4	2	#
Yuba	*	*	#	#	2	#	3	*	*	*	*	#	#

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*Less than 2 per cent of state's normal crop grown in county.
#Not grown commercially.

THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical and other publications of a similar nature.

G. H. HECKE, State Commissioner of Horticulture____________________________Censor
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Entered as second class matter December 29, 1911, at the post office at Sacramento, California, under the act of June 6, 1900.

Our purpose.

This issue of the bulletin deals with matters intimately linked with the cause of our country—the philosophy of the future for the men behind the gun and the men behind the plow. The logic of events during the initial period of the present crisis has made it plain that a consistent cooperation of these two great forces is essential to success.

Five months have wrought a remarkable transformation of conditions. We are beginning to realize that we are charged with a resolute purpose, and that we must sacrifice, if need be, in order to guarantee a continuance of that peace and security we now enjoy in our home life and in our industries.

Sacrifice is an inevitable condition. We must realize that we will be unable to reap all the reward we had anticipated of agricultural action, but withal, how small our sacrifice of material things when we think of those who have placed their lives and fortunes in the hands of the pitiless fate of war. California's response to the call of the nation has proved an inspiration; merchants, mechanics, farmers, and professional men, regardless of the nationality from which they originally sprung, have forged a chain without a weak link. The farmer has proved generously patriotic. He was prompted by loyal motives, and has been assisted by particularly favorable climatic conditions. His answer to the appeal of the men placed by the state in charge of arousing his activities, has been indeed gratifying. Under such conditions a financial reward is honestly earned, and his mind should be in a receptive mood for suggestions relative to systematic provision for the coming year.

"What to do and how to do it," is the problem. War conditions may arise that will force the farmer to break with traditional policies and business habits, and the normal course of procedure will be interrupted. The government may be forced, in order to meet requirements, to exercise a more paternal power over economic conditions. While the farmer may feel that he is being hemmed in, and that his liberties are being circumscribed, he will realize that after all in a time of national necessity some general guidance must force effective work and cooperation along the line of necessity.

Restriction may force the elimination of the objectionable features of a vicious system of speculation. Administrative action may restore a market to the producer properly regulated by the local law of supply and demand. It is obvious at this time that congress purposes to intercede in the distribution of the products of the soil, but there is no implied threat that maximum prices to the producer will be fixed by congressional action—though congress has recently established a reasonable minimum price for some cereals. The purpose of the nation should be and will be to protect the producer and consumer and to eliminate, so far as possible, the insidious interference of the speculator.

The farmer has not been, is not now, and will never be the principal offender in unduly inflating the prices of food products, and if it were not for the unscrupulous food speculator—fortified in his position as owner of products necessary to life stored safely in warehouses—a national food commissioner, as now contemplated by the government, might not be necessary.

The writer is essentially a farmer, and he believes that the government's course in appointing this food commissioner is a wise and honest one to pursue; to put a check on the speculator and to insure the standard profit to which the farmer's skill and investment of capital entitle him. No particular pecuniary bribe is needed for the farmer to do his duty to his nation. With the certainty of a reasonable profit. they, as patriotic citizens, will do their best to overcome the difficulties that will surely be met in the course of their next year's work.

The question of transportation may become serious. The scarcity of labor for agricultural work may be accentuated as our young men join the colors. California farming is in a class of its own, and often the limiting factor in the acreage utilized for crop production is the scarcity of labor. This season when the plea came from our President to increase the planting of food crops, the farmers of the state made ready response. In many cases, however, the knowledge that labor is scarce and that too extensive planting would involve great losses through an inability to harvest, prevented the cropping of much land which, with an adequate supply of labor, could be utilized. We realize this, and perhaps as the government is now providing a food commissioner, national necessity may demand national action in drafting labor for agricultural needs. We have seen most satisfactory service performed by men and boys who are not accustomed to farm work. Next year, with better organization and under a better system, we trust that these men and boys will be able to do even better work.

We realize that these adjustments can not be accomplished without a great effort, and knowing that we have to face many special difficulties in these times of war, the writer of these lines believes that a timely discussion of our farm problems is in order; hence, most of the space of the September issue of the "Monthly Bulletin" is devoted to an appeal to the agricultural interests by authoritative writers.

G. H. H.

Horticultural quarantine and preparedness.

The Quarantine Division of the State Commission of Horticulture is cooperating with the nation in the general scheme of preparedness, to the extent of keeping out of the state and country insect pests and plant diseases that would reduce the yield and increase the cost of crop production. Taking as a basis from which to compute the value of this service, the reduction of the gross yields of merchantable crop products brought about by the destructive work of the cotton boll weevil, alfalfa weevil, Mexican, melon and Mediterranean fruit flies, citrus canker and chestnut bark disease, none of which—either as a result of good fortune or the diligence of the quarantine inspectors—are yet established in California, the Quarantine Division may be credited with "doing its bit" towards the consummation of that national teamwork in crop production and preservation so earnestly requested by the Secretary of Agriculture. The quarantine office is a place of performance, not promise. It is accustomed to meeting contingencies, dealing with the same in a straight forthright way, and officially recording the plain facts concerned with the occurrence. Not being given to boasting, it is making no rash pledges of achievements to be accomplished in a spectacular manner in the near future, but believing firmly in the necessary purpose of its work it may be safely trusted to develop sufficient initiative and acumen to keep up with the needs and spirit of the times. To drop into the vernacular of the period, the quarantine service has been in action continuously for twenty-seven years, and as a natural result of this experience the force is always in a state of prime preparedness to meet the enemy—ready to go over the top of a ship's side at sunrise every morning in the year—and may be depended upon, if adequately supported, to defend our thousand mile coast line against any invasion of the insect pests and plant diseases that are eternally trying to rush the breastworks.

F. M.

Economy in insect control through the use of parasites.

It is hardly necessary to say that economy must be given a prominent place in any agricultural preparedness program. Economy was the motive which caused the early horticulturists to become interested in the biological method of pest control, *i. e.*, control by natural enemies. It would be difficult to compute in dollars and cents the saving to California horticulture through the introduction of the Australian ladybird for the control of the cottony cushion scale, but it meant the salvation of the citrus industry. The establishment of the State Insectary was the result of the lesson taught by the introduction of the Vedalia.

Pest control by the biological method is first of all economical. During the past year the citrus growers of California spent $1,300,000 on cyanide alone for fumigating against insect pests. It would be far-fetched, indeed, to say that this entire sum could be saved by the use of parasitic enemies, but it is certain that an appreciable portion of it could be thus saved. Besides the saving of funds, labor required for fumigation and spraying is released for work more directly connected with the production of food. It is true that practical results from the introduction of parasites are slow in evidencing themselves, but parasite work carried on in past years in California enables us now to control our pests at a lesser cost than otherwise would have been the case.

Crops of such great importance from the food standpoint, as grain, sugar, beans, and olives, are reduced very materially every year by insect attack. Part of this loss can undoubtedly be avoided by the use of the parasitic and predaceous enemies of the pests. The French Government has, since the outbreak of the war, come to see the importance of parasite work, and now has in process of establishment an insectary for work with beneficial insects.

The Insectary Division of the commission makes no promises. We are attempting to put into more general practice a theory which has already been proven in certain cases. The relation of parasites to climatic conditions and to other insects is so complex that it is an impossibility to forecast the results of our work in the slightest degree. The goal towards which we are striving is larger crops of agricultural products at less cost of production, and we have sufficient confidence in the practicability of the biological method of pest control to believe that in this work we can do our bit for preparedness.

H. S. S.

Standardization of the fruit pack and conservation.

The standardization movement as it relates to the packing of fruits has made rapid progress in the past three years. It is not some fad that will be taken up for a time and then dropped, but, on the contrary, something that is vital to the future of the fruit industry of the state. As production increases there must be a broadening of the markets through which the consumer is reached. The latter is demanding a high grade product, and something that is uniform and dependable. Standardization is an altogether successful attempt to increase the market for our fruit; to stabilize prices for the grower and consumer and to enable the consumer to get good fruit.

RELATION OF STANDARDIZATION TO CONSERVATION.

In this time of extreme need, when it has become necessary to conserve every food product to the limit, the public is vitally interested to know of the effect of standardization upon conservation. Definite data is lacking at present, but there is every reason to believe that the ultimate result of standardization will be to conserve as well as to standardize our fruit products.

In the first place, there is more encouragement than ever before for the building of by-product factories. Every one familiar with the fruit business knows that tons upon tons of low grade fruit have rotted in our orchards because of no market and no by-product plants to handle it. The interest in by-products is stimulated by standardization more than in any other way, and thus we may expect many factories to be built for the conservation of our fruits such as have been wasted in times past.

Secondly, standardization furnishes an impetus to do better work in pruning, spraying, irrigation; in fact, all orchard operations must be performed well to secure maximum yields of the finer grades of fruit to be used in standard packs. There are many smaller orchard owners who do not spray their orchards, and who have been satisfied with meager returns for poor fruit, that they will not be able to sell under our present laws. Such orchards as these that will now be sprayed and better cared for in general, will add a considerable amount to the sum total production of marketable fruits, much of which would otherwise have rotted because of disease and insect attack.

In passing the standardization laws, one relating to the packing of apples, the other to the packing of deciduous fruits, exclusive of the apple, the recent legislature took action which, it is believed, will result in far-reaching benefits to the fruit industry of the state, an industry which has long suffered because of the poor grade of fruits that have been placed in the markets for sale. Much of this fruit has been green, diseased, insect-infested and of inferior quality in general. Such fruit is not only of little value to the consumer who buys it, but frequently is unfit for consumption, and from a health standpoint should be condemned for use as food.

The feeling has existed among a certain class of fruit growers that it should be their privilege to sell anything that the public will buy. This narrowminded view has been a boomerang in the business and has come back against the grower so that he suffered through poor prices and a slow demand, even for high grade fruit that ordinarily sells for a good price.

BENEFIT TO CONSUMER.

One of the principal arguments that has been advanced against standardization of our fruit packs is that it will increase prices to such an extent that an undue hardship will result to the class of consumers of very moderate means who can not afford to pay for a good article. There are three good reasons why this argument will not hold. First, the grades provided for in the standardization laws are such as to permit the packing of practically all fruits that are fit for consumption; secondly, accurate grading is required so that the consumer, when buying a box of packed fruit, is assured that deception has not been practiced in packing and the product is uniform throughout the container; thirdly, it seldom pays to buy the very low grade fruits, for the waste is often sufficient to justify the purchaser in paying one-fourth or one-half more for a good product. This point may be well illustrated by wormy apples. In the removal of all portions unfit for use of an apple infested with the codling moth, it is not at all uncommon to cut away from one-fourth to one-half of the edible portion. The elimination of wormy apples from the markets where they are now sold in large quantities would thus protect the consumer against this heavy loss. The same argument applies to misshapen, diseased or otherwise inferior fruits, and when the fruit business of California reaches the point where the different grades that are packed are uniform, free from insect pests, disease and injurious imperfections, and are labeled so that the consumer can tell what grade he is buying, his money will go further and he will have better fruit to eat.

BENEFIT TO THE GROWER.

Widely-fluctuating markets have made the fruit business hazardous in the past, and anything that will tend to stabilize the market and at the same time assure the grower of enough more than the cost of production so that he can make a fair profit on the money invested, will be beneficial. Standardization is expected to do this, and already results that are altogether satisfactory and far-reaching have been attained. Especially noticeable benefits have resulted to the shipping grape industry. It was long the practice to ship grapes of the Malaga variety before they contained enough sugar to make them palatable. Such grapes have sold on the Eastern market early in the season, because of the scarcity of fruit at that time, and because they were the first grapes in the market. Their inferiority has had a very bad effect on the future market for grapes, and California growers have been the losers. With the present fruit standardization law in effect, the grower can not ship until his grapes reach a sugar content of 17 per cent, or 16 per cent in the case of Emperors, Gros Coleman and Cornichons. This provision of the old law passed in 1915, and which is also embodied in the 1917 law, was found highly satisfactory, and the testimony of the grape growers is to the effect that their business has been greatly enhanced by standardization. What has been found helpful with grapes will be helpful with all other fruits, and the standardization movement, now in its infancy, will grow, until all California fruits will be of such quality and packed in such manner that they will always be in demand in the markets everywhere.

G. P. W.

Squirrel control.

The California ground squirrel (*Citellus beecheyi*) plays the double role of pest to the farmer, by destruction of his crops, and a menace to the health of a community, for it carries the flea which inoculates human beings with the organism that causes bubonic plague. Because of these two exceedingly bad characteristics, its eradication has been attempted at various times and in various places. There has never, however, been a well organized movement to rid the entire state of this pest. This statement is made without any thought of minimizing the importance of the splendid work that has been done by the Department of Agriculture, by local boards of supervisors, and by the California Board of Health, which has been active and efficient in cases where the law has empowered it to act. Its jurisdiction has not extended outside of those counties where plague is known to occur, consequently its field of action has been somewhat limited.

On July 27 an amendment to the law, relating to the county horticultural commissioners, became effective. Under the terms of the act, as it now stands, it becomes the duty of each horticultural commissioner to eradicate or control squirrels as well as other pests, within the county for which he is serving. This arrangement should result in tremendous benefit to the agriculturist. Being empowered by law to establish districts within a county, and to place inspectors in charge of the work in each district, and being empowered also to eradicate or control such pests upon the failure of the owner or lessee of land to do so, the expense of such eradication or control to become a lien upon the property, the county horticultural commissioner should conduct such a campaign against squirrels as heretofore has been impossible.

Because of the importance that we believe this phase of the county horticultural commissioners' work will assume from the standpoint of increased production, several of those who have already become actively engaged in the work of eradication have been asked to prepare articles telling of their plans and success up to the present time. These articles are printed in the county horticultural commissioners' section of this number of the bulletin. They indicate what can be done by commissioners serving in forty-seven counties of the state, which is the total number of counties now employing these officials. With the cooperation of county boards of supervisors and farmers, with the aid and encouragement of the Department of Agriculture, and with the support of the State Board of Health and the State Commissioner of Horticulture, the success of the campaign just begun seems assured.

G. P. W.

Colorado pointers on ground squirrel control.

We are printing in this number of the bulletin a short article on the control of a Colorado ground squirrel which is closely related to the common California species. The writer of this article, Mr. W. L. Burnett, has been very successful in the use of a formula which he designates Formula No. 28, in which gelatine is used to coat the grain. He suggests that "the gelatine coated grain should have a decided advantage over all others in California, as it will stand more moisture and still be effective."

Having been associated with Mr. Burnett, under State Entomologist Dr. C. P. Gillette of Colorado, for a number of years, and knowing of his painstaking work and success in the control of rodents, the writer of this editorial believes that the formula is worthy of a trial by those who are poisoning squirrels in California.

G. P. W.

POISONING GROUND SQUIRRELS.

By W. L. Burnett, Deputy Pest Inspector, Fort Collins, Colorado.

For the past four or five years, the state of Colorado, through the office of the State Entomologist, has been carrying on extensive experiments to secure the best and cheapest methods for the control of ground squirrels, prairie dogs, and other rodents destructive to agricultural crops.

In these efforts we have been very successful. The Wyoming ground squirrel (*Citellus elegans*) that inhabits the northwestern counties of the state, has been our hardest problem. It would take poison very readily in early spring when it first came out of hibernation, but after green food became abundant it would not eat the poison to any great extent. The writer, knowing this to be a serious drawback to the successful control of this pest, spent the greater part of two seasons during the period of activity of the squirrels, experimenting with poisons, and combinations of poisons, to overcome this difficulty. After two seasons trial, we are satisfied that in Formula No. 28, as given below, we have a formula that can be used successfully at any season of the year when the squirrels are active, no matter how abundant the green food.

In California the two species of ground squirrels most destructive to agricultural crops, are the California ground squirrel (*Citellus beecheyi*), and the Douglas ground squirrel (*Citellus douglasi*), both of which are larger and have longer tails than *Citellus elegans.*

The food habits of the three species are very similar, the greatest difference being that the two California species do serious damage to fruits and nuts, while in Colorado neither fruit nor nuts are raised in the section infested with Wyoming ground squirrels.

The two California species are active the year around, except in the mountain portions, while the Wyoming ground squirrel's season of activity is only about five months in the year, and the most difficult months to successfully use poison have been July and August, while with the California ground squirrel the difficult months are December and January.

As December and January are in what is known as the rainy season in California, the gelatine-coated grain should have a decided advantage over all others, as it will stand more moisture and still be effective.

We are not making any statement as to what can be done with this formula for the control of the California ground squirrels, as it may be a complete failure—we only know what has been done with the Wyoming ground squirrel in Colorado.

The writer is fully aware of the fact that the poison which will successfully control one species of ground squirrel may fail with others, and is also strongly of the opinion that different environments may mean success or failure, even with the same species.

Colorado Formula No. 28.

PART 1.

Oats	14 quarts
Strychnine, alkaloid powdered	1 ounce
Starch	½ pint
Water	1 quart

PART 2.

Knox gelatine, No. 1 plain (2 envelopes)	1 box
Baking soda	1 ounce
Dark brown sugar	½ pound
Water	1 quart

Directions. Treat grain first with Part 1, as follows: Dissolve the strychnine in the quart of water; add the starch and stir until it is all dissolved; put over fire and heat until starch begins to thicken, stirring constantly.

Pour the poisoned solution over the grain; thoroughly mix, until each grain is evenly coated; let stand for five or six hours.

Re-treat poisoned grain with Part 2, as follows: Dissolve gelatine in warm water (not boiling), add soda and stir until it stops foaming, then add sugar and when dissolved pour over the poisoned grain and again mix thoroughly; spread and dry.

One teaspoonful of the poisoned grain is sufficient for each burrow. It should be placed on dry, hard surface outside the burrow.

Follow directions carefully.

If the best results are to be obtained, alkaloid strychnine must be used for the following reasons: Alkaloid strychnine is soluble in about 65,000 parts of water, and the sulphate in about 40 parts, therefore the sulphate is more bitter than the alkaloid and consequently distasteful.

The reason soda is used in Formula No. 28 is, that it makes the alkaloid insoluble and when insoluble it is tasteless, and therefore more readily eaten by rodents.

The chemical formulas of the two forms of strychnine differ. Sulphate contains sulphuric acid and water, which are not found in the alkaloid, and which go to make up one-fourth of its weight, or in other words, one ounce of alkaloid strychnine contains 100 per cent poison, while one ounce of sulphate contains only 75 per cent. Therefore, in poisoning 42 quarts of oats, for example, it would require three ounces of alkaloid strychnine, but if sulphate is used four ounces would be required. Sulphate is not recommended, for the difference in the solubility of the two forms of strychnine practically prohibits its use.

Editor's Note.—Since the above article was received for publication, County Horticultural Commissioner S. V. Christierson of San Luis Obispo County has tested a sample of poison which was sent to this office by Mr. Burnett, who requested us to have it tried on *Citellus beecheyi* under California conditions. We quote from a letter written to State Horticultural Commissioner Hecke on August 23, in which Mr. Christierson writes of his test of the sample as follows:

"I have tried it out, the whole bag, in probably one of the worst squirrel-infested places in the district, and to the best of my knowledge, the approximate two gallons sent, produced the net result of killing four squirrels. Examinations were made three days in succession, one squirrel was picked up the day after the poisoned oats were put out, two the second day, and one the third day.

"Of course, I do not know the formula used, but one reason it did not work was because it was not eaten very readily, as the squirrels here are used to barley and wheat, not to oats."

COUNTY COMMISSIONERS' DEPARTMENT.

SQUIRREL ERADICATION IN KINGS COUNTY.

By Fred K. Howard, County Horticultural Commissioner, Hanford, California.

That the ground squirrel is the worst crop pest in Kings County is an admitted fact, and more than a year ago the board of supervisors passed a county ordinance relating to the control of this pest and appointed inspectors to enforce its provisions. This ordinance was apparently too weak in some parts to enable the county to do the work on the property which the owner neglected or refused to clean up. Consequently, those who are willing to kill the squirrels on their land became disgusted and declared they would do nothing until all were forced to do the work. When the new law passed the legislature, it was regarded by the supervisors as a solution to the problem and they immediately took the necessary action to place the work in this department.

Because of the failure of the county ordinance to accomplish the desired results, it has become necessary that our campaign be so thoroughly conducted that our people can have no cause to complain. To accomplish this it seemed advisable to serve notices of eradication on every landowner in the county. These first notices I have termed "Legal Reminders," for, while they are legal in form and give the description of the land, we are not attempting to get legal service on each notice, *i. e.*, delivery of a copy to the person in charge and reading the original to him. We do try, however, to see that each notice gets into the hands of a responsible member of the family, that the purpose of the notice may be explained, the law discussed, and information given regarding the best methods of squirrel control. We feel that this will give our people confidence that things are being done, for each person will know that his neighbor received the same sort of notice and that all are expected to do their duty.

It also gets this office in personal touch with every one in charge of land and the inspectors make notes of the manner in which they were received. An office record is kept, showing whether or not each notice was served in legal manner and in case it becomes necessary to take action at the expiration of the term of the first notice, a new notice is prepared, allowing not more than five days to accomplish the work. We are very careful that this second notice is absolutely correct and that it is served in exactly the manner provided for in the law.

Educational Campaign.

I believe that educational work should have a large place in a campaign of this sort, and to this end we are arranging a series of meetings in schoolhouses and civic centers throughout the county. At these meetings the new law will be explained and the policy of this office, regarding its enforcement, will be outlined. Methods of preparing and distributing poisoned grain and the use of carbon bisulfid will be explained and demonstrated, and an effort made to organize each community for the purpose of naming a squirrel day, when all in that section will put forth their best efforts to rid their lands of this pest. We are in a position to assure them that all the county property, including roadsides, will receive attention at the same time, and that there will be a representative from this office on the ground during the day to render all possible assistance. An attempt will be made to hold these meetings at about the same time the first notices are being served in each district. The United States Biological Survey will cooperate in this educational campaign.

The county has purchased a quantity of poisoned grain to be sold at cost to residents of the county, and our slogan is, "Kill Your Squirrels. The county furnishes the 'ammunition' at cost and Uncle Sam shows you how to use it."

We have made a plat book of the county showing divisions of the land and the ownership. These maps are made on especially ruled paper and in thinly settled sections a sheet may show the entire township, while in more thickly populated sections the same sized sheet may show as low as four sections. Each inspector is furnished with a plat book of this sort, covering his particular district. We have found that these plat books are of great assistance and save much time in locating owners of land. This plan of procedure might not be of value to other counties, but we feel it is the best way for us to combat the rancher's worst pest, "His Neighbors' Squirrels."

SQUIRREL CONTROL METHODS IN KERN COUNTY.

By Kent S. Knowlton, County Horticultural Commissioner, Bakersfield, California.

The ravages of the squirrels had to be checked. The new law came almost as a godsend. As soon as we knew that Senate Bill No. 458 had been signed by the Governor, we began work.

Our office made a thorough canvas of the county to find the extent of the infestation and found practically no squirrels on the Mojave Desert, a minimum number in the higher mountains, and a very heavy infestation in the foothills and valley.

In checking up on our survey we were able to report to the supervisors that through the Bureau of Biological Survey, the United States Department of Agriculture was handling the squirrel problem in the forest reserves. The valley and desert section contain about 164 townships for us to handle. The supervisors gave us their fullest support and asked us to give them an outline of our plans and an estimate of probable cost. We reported back asking for five more Ford cars, six additional inspectors, $6,000 and the privilege of using the balance of our annual budget, if necessary, which will amount to about $3,000. In addition to the new inspectors provided, we plan to use two or three of our regular inspectors.

Our plan includes a double card index system, one set of cards for alphabetical ownership, using a 240 subdivision index, with 100 additional metal tags. The cards for this index contain on the top, the owner's name and address, also the name and address of the man in charge. The balance of the card is ruled on both sides for legal description and acreage of each separate ownership, no one ownership to include more than one section. Twenty to thirty ownerships can be written on one card.

The other set will be for location index. The main guides will have the township and range in the upper left-hand corner. Each township will contain thirty-six section guides, numbered from one to thirty-six. These guides are ruled to contain owner's name with the description of each ownership in the section. Back of these section guides will be a separate card for each ownership in the section. These cards will be used by the field inspectors and contain, on one side, first, the township, range, section, owner's name and address, and the name and address of agent or person in charge, in case the notice is served on one of them. It will also contain the date of service of the notice, with description of real estate, as well as the date of inspection, date of expiration of notice, and amount of infestation (light, medium or heavy), estimated cost per acre of eradication, and the inspector's signature.

The other side of the card will be printed to show that it is from the office of the Kern County Horticultural Commissioner and is the memoranda of actual cost of material furnished and labor performed on the land as described on the reverse side of the card. This takes a small space at the top of the card and the balance is printed to show the date, items, amount, date paid, and date charged. All of these cards are 4 by 6 inches in size.

Our abatement notice will be about the same as those generally used in the weed work.

We have divided the infested portion of the county into districts, no one district containing more than twenty townships. We do not feel that these are too large for the inspectors, and they are necessarily large, as there are companies having very extensive holdings in each district. In most of the districts the inspection work can be done with a Ford, but in two or three districts we have made arrangements for the inspector to have a saddle horse.

All inspectors are instructed to watch closely any parties doing poisoning by contract or day work, especially for nonresident owners, and report upon the results of such work. Our aim is to kill as many squirrels as possible and at the same time keep the expenses at the minimum.

We have discussed the matter with some of the large land holding companies and they have agreed to start poisoning on the outside of their holdings and work towards the center, in this way protecting the small adjacent holder from having his land reinfested after he once has it cleaned.

We are assisted very materially by the Farm Adviser and the Farm Bureau. The Farm Adviser has taken up the matter of squirrel control in all sections of the county. He has also established depots in each Farm Bureau district where poison can be purchased at actual cost. The directors of the County Farm Bureau, at their last regular meeting, authorized the Farm Adviser to purchase twenty-five tons of poisoned barley, and to make necessary arrangements to handle any other material required in the work.

With the hearty support we have received from the supervisors, the Farm Adviser, the Farm Bureau, and the Bureau of Biological Survey, we feel that great good can be accomplished this fall.

The labor problem looks bad at the present time, for the most efficient results in the campaign, but we are making plans to overcome that obstacle.

THE SQUIRREL ERADICATION CAMPAIGN IN SAN LUIS OBISPO COUNTY.

By S. V. CHRISTIERSON, County Horticultural Commissioner, San Luis Obispo, Cal.

Early this spring it was learned that a squirrel eradication campaign had been carried on successfully by the County Agent and a representative of the United States Biological Survey, in several of the counties in Oregon. When any one mentions squirrels in San Luis Obispo County, in connection with eradication, the other fellow generally takes notice. as squirrels are by far our most destructive pest, not only to our horticultural interests, injuring severely our new fruit trees each year, but to grain and feed. By conservative ranchers the loss of these two products for the year of 1917 has already been estimated at $300,000, which is none too high. Last year $16,000 was expended by the County Board of Supervisors for bounties. At 5 cents apiece, this paid for the destruction of 320,000 squirrels, and estimating, as the Biological Survey does, that 20 squirrels will eat as much as one cow, the county paid for the feeding of 16,000 head of cattle. So when a few more details on what had been done in Oregon were received, I immediately proceeded to investigate how the same results might be accomplished in San Luis Obispo County.

At this time it was learned that in all probability the county horticultural commissioners of California would shortly be expected to superintend the eradication of ground squirrels and other rodents, as the legislature had recently passed a new section of the County Commissioners Act, adding this feature to one of his numerous duties. This gave new impetus to the work, especially as at the time the campaign was being organized Governor Stephens signed the above-mentioned bill, making it a law.

Following some correspondence, the Chief of the United States Biological Survey at Washington, D. C., promised to detail an assistant from the bureau to help me in this work. Accordingly, Mr. W. C. Jacobsen, Biological Assistant, United States Department of Agriculture, came to San Luis Obispo in May, and a thorough educational squirrel campaign was organized along the following lines:

FIG. 120. Lecturing before a local farmers organization on the eradication of the California ground squirrel. (Original.)

Posters announcing a series of meetings were distributed throughout the county, as much publicity as possible through the press of the county was given the movement, and on the date and hour set for the first meeting Mr. Jacobsen and the commissioner were on hand to conduct it. On the following page is a copy of this poster.*

In a brief talk the commissioner explained at each meeting how the recently enacted County Horticultural Commissioners Act would affect the ranchers; what powers and duties in connection with squirrel control had been delegated to these officials, and how the law would be administered with reference to landowners, absentee landowners, government land, railroads, state highways, county roads, and vacant land. It was mentioned that subsequent to July 27 it would be his duty to eradicate ground squirrels whenever the landowner was unwilling or refused to do so, and that such work would be at the landowner's expense, through a lien on his property, which, according to the law, would take precedence over and be paramount to all other liens on the property, except the lien of taxes.

FIG. 121. Demonstrating the mixing of poisoned grain for use in killing ground squirrels.

After reading the pertinent parts of section 2322*a*, Mr. Jacobsen was introduced. He explained the Biological Survey's part in this work, and told of their having charge of squirrel eradication on all government land, and the government's interest in it as a conservation measure during these war times. He entered into a detailed discussion of the Beechey ground squirrel, its life history, feeding and breeding habits, and its economic importance, stating that it causes more than $10,000,000 damage in the United States each year. In this connection Mr. Jacobsen cited several instances: one on Union Island in the San Joaquin River, an island consisting of some 18,000 acres, where the ranchers themselves estimate a yearly damage of $65,000 caused by ground squirrels; of a rancher near San Miguel, who for the first five or six swaths around his grainfield obtained a yield of 15 sacks to the acre, while in the middle of the field, where the squirrels had not damaged the grain the yield reached 30 sacks; of a young orchard in the northern part of the county where 200 out of 300 young almond trees had been completely destroyed. In discussing control measures, Mr. Jacobsen stated that the survey had experimented with 153 different kinds of poison, only to return to strychnine as the most effective for killing squirrels. After years of experience in the national forests and

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*Similar posters have been used by the commissioners in other counties.—EDITOR.

EDUCATIONAL SQUIRREL ERADICATION CAMPAIGN

BY SAN LUIS OBISPO COUNTY HORTICULTURAL COMMISSION
U. S. DEPARTMENT OF AGRICULTURE BIOLOGICAL SURVEY COOPERATING

THIS WEEK
WAR BEGINS

ON ALL SQUIRRELS AND GOPHERS
IN SAN LUIS OBISPO COUNTY

EACH MAN DO HIS DUTY

COME TO THE NEAREST MEETING PLACE AND FIND OUT

HOW TO KILL THESE PESTS

DON'T BE A SLACKER AND JEOPARDIZE YOUR NEIGHBORS' CROPS
CONSERVE YOUR CROPS BY FIGHTING YOUR MOST SERIOUS PEST

The Government is asking you to increase the food supply. You can assist in this great movement by the eradication of the pests that waste instead of conserve what you have already planted.

NOW IS THE TIME TO LEARN the cheapest and most efficient way of poisoning.

UNCLE SAM WILL SHOW US HOW.

MEETING DATES

Cholame	Monday,	June 11,	3.00 p.m.
Shandon	Monday,	June 11,	7.30 p.m.
Creston	Tuesday,	June 12,	10.00 a.m.
Union	Tuesday,	June 12,	3.00 p.m.
Paso Robles	Tuesday,	June 12,	7.30 p.m.
Estrella	Wednesday,	June 13,	10.00 a.m.
San Miguel	Wednesday,	June 13,	3.00 p.m.
Willow Creek School	Thurs.,	June 14,	3.00 p.m.
Templeton	Thursday,	June 14,	7.30 p.m.
Santa Margarita	Friday,	June 15,	3.00 p.m.
Atascadero	Friday,	June 15,	7.30 p.m.
Arroyo Grande	Saturday,	June 16,	10.00 a.m.
Simmler	Monday,	June 18,	7.30 p.m.
Pozo	Tuesday,	June 19,	10.00 a.m.
La Panza	Tuesday,	June 19,	3.00 p.m.
Edna	Wednesday,	June 20,	10.00 a.m.
Pismo	Wednesday,	June 20,	2.00 p.m.
Nipomo	Thursday,	June 21,	10.00 a.m.
Berros	Thursday,	June 21,	2.00 p.m.
Oceano	Thursday,	June 21,	7.30 p.m.
Cambria	Friday,	June 22,	10.00 a.m.
Cayucos	Friday,	June 22,	3.00 p.m.
Morro	Friday,	June 22,	7.30 p.m.
San Luis Obispo	Saturday,	June 23,	3.00 p.m.

The U. S. Biological Survey has been successfully conducting campaigns for

RODENT CONTROL.

Thousands of acres have been practically cleared of squirrels and gophers. San Luis Obispo County can do the same.

IT IS UP TO YOU.

Come out and work with your neighbors.

GET THE YOUNG ONES NOW

SAVE THOUSANDS OF DOLLARS LOSS BY SYSTEMATIC COMMUNITY EFFORT

W. C. JACOBSEN, Assistant U. S. Biological Survey, Washington, D. C.
S. V. CHRISTIERSON, County Horticultural Commissioner.

on government lands, the revised formula, now recommended and distributed to the farmers by Mr. Jacobsen at each meeting, is as follows:

GOVERNMENT FORMULA.

Barley—clean grain	16 quarts
Strychnine (powdered alkaloid)	1 ounce
Bicarbonate of soda (baking soda)	1 ounce
Thin starch paste	¾ pint
Heavy corn sirup	¼ pint
Glycerin	1 tablespoonful
Saccharin	1-10 ounce

Mix thoroughly 1 ounce of powdered strychnine (alkaloid) and 1 ounce of common baking soda. Sift this into ¾ pint of thin, hot starch paste and stir to a smooth creamy mass. (The starch paste is made by dissolving 1 heaping tablespoonful of dry gloss starch in a little cold water, which is then added to ¾ pint of boiling water. Boil and stir constantly until a clear thin paste is formed.) Add ¼ pint of heavy corn sirup and 1 tablespoonful of glycerin and stir thoroughly. Add 1-10 ounce of saccharin and stir thoroughly. Pour this mixture over 16 quarts of clean barley and mix well so that each grain is coated.

For mixing small quantities an ordinary galvanized washtub is convenient. For larger quantities a tight, smooth box may be used, and the mixing may be done with a spade.

Each quart of the poisoned grain is sufficient for 40 to 50 baits. This quantity scattered along squirrel trails, or on clean, hard places on the surface about the holes, will not endanger stock.

N. B.—Strychnine in any form other than the powdered strychnine alkaloid is not effective in the above formula.

Caution. All poison containers and all utensils used in the preparation of poisons should be kept *plainly labeled* and *out of reach* of children, irresponsible persons, and live stock.

FIG. 122. Squirrel holes as they appear in the banks of most any county road. The squirrels devastate the adjoining fields, and in the rainy season the holes in the bank become a menace to the road. (Original.)

The Biological Survey recommends grain poisoning for the dry season, especially after the grain has been harvested, and carbon-bisulphide in the wet season, either pumped into the burrows or on saturated waste balls, which are thrown into the holes. All of the waste balls thrown into a colony are ignited at once by the last ball thrown in. Immediately the holes are quickly covered and an explosion which renders the gas much more effective, takes place. Care must be taken, however, not to use this method during the dry season, because of danger from fire. The porosity of the soil during the dry season is also responsible for poor results.

At the end of his talks Mr. Jacobsen always urged the farmers present to organize a squirrel club for the purpose of interesting every land owner in the vicinity to act at the same time, and to secure supplies, such as strychnine and carbon-bisulphide, at wholesale prices. At each of the twenty-one meetings held, an organization of this kind was formed, where a farm bureau center did not already exist, in which case the farm center would agree to act exactly as an organization formed for the specific purpose of squirrel eradication. Each land owner present interested in squirrel eradication signed up with the secretary for the amount of poisoned barley be wished to purchase through the organization, while Mr. Jacobsen mixed a sample batch of poisoned barley, to show the farmers how the new formula is prepared.

The attendance for the twenty-one meetings, held in every section of the county, totalled 529, or an average of 25 for each meeting. The total amount of poisoned barley signed up for by those present was 11,520 quarts, or an average of 21.6 quarts for each rancher attending. This amount has, since the close of the campaign, been more than doubled; in several instances quadrupled, as the demand from people not present at the meetings has been very heavy, due to the excellent results obtained by their neighbors with the poison.

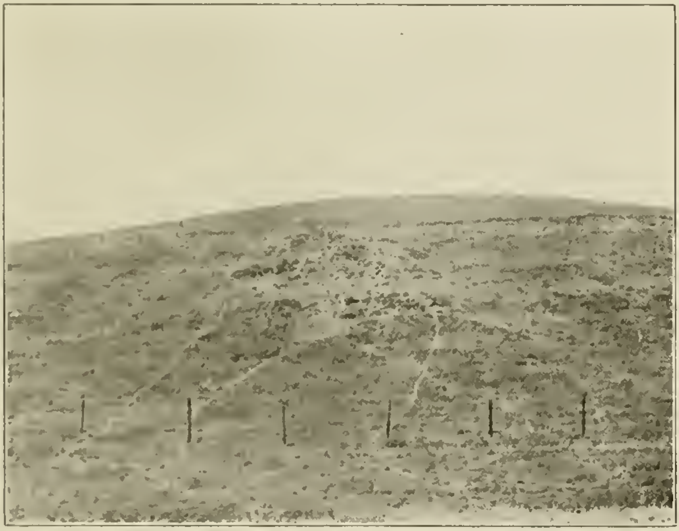


FIG. 123. Runways of the California ground squirrels in a grainfield after the crop was harvested. (Original.)

San Luis Obispo County was particularly fortunate in being the first county in the state to receive federal assistance in this work. That the campaign was highly successful, was due in a great measure to the presence of a government man at the meetings, a tangible evidence that the government was interested in the work. Moreover, a specialist who is an able speaker, is always an asset at any meeting.

A campaign of this kind is, to say the least, arduous, as any one can understand who knows what it means to hold from one to three meetings every day for two weeks, driving from twelve to sixty miles in order to do it. But the effort has been well repaid by the interest and enthusiasm with which most ranchers are taking hold of their squirrel problem.

SQUIRREL CONTROL IN TULARE COUNTY.

By CHAS. F. COLLINS, County Horticultural Commissioner, Visalia, California.

No sooner had Governor Stephens signed the amended horticultural law which pronounces sentence of death upon the ground squirrels of California than Tulare County farmers began urging preparations for making the law effective at the earliest possible moment.

In accordance with this feeling which was everywhere in evidence, the supervisors appropriated funds for the purchase of barley and poison which is mixed according to the government formula under the supervision of an expert and dispensed at actual cost to the county. We find plenty of merchants throughout the county who willingly handle this poison without commission, partly perhaps from selfish motives, as it draws customers, but we believe more largely from a patriotic principle.

Early in July we met Mr. W. C. Jacobsen, Biological Assistant, who has charge of the rodent control work in the national forests and public domains of this state and learned that his division of the United States Department of Agriculture would gladly cooperate with any commissioner in an educational and demonstrational campaign along this line without one cent of expense to the county. We are very strong on partnerships of this nature and lost no time in arranging for a series of twenty meetings beginning July 16 and continuing until August 7 and covering the county as thoroughly as possible.

Two hundred two-color posters (eighteen by twenty-four inches), announcing these meetings, were posted in conspicuous places and every one of the fifteen newspapers in the county assisted by printing free notices, many of them repeating these several times and adding favorable editorial comment.

At these meetings the writer explains the requirements of the new law covering rodent control, states the general conditions in the county, giving data to prove the dire necessity for a campaign of eradication and the advantages to be derived from it, as well as outlining his plans for the campaign and urging cooperation in the work.

Mr. Jacobsen follows with a most interesting talk upon the habits and life history of these pests and the losses caused by their depredations. More important, however, is his discussion of the latest and most up-to-date methods of control of the various rodent crop destroyers. The Bureau of Biological Survey has had men in the field conducting experiments in control methods for the past twenty-five years, aside from the actual extermination operations in national forests, and Mr. Jacobsen has the benefit of the experience of his predecessors as well as that secured by himself in his number of years with the bureau.

While those present do not represent all the farmers, they serve as disseminators of the information received at the meetings. At this writing one-half of our itinerary has been completed and we have addressed four hundred and eleven people with splendid results already evident.

I cannot refrain from emphasizing the many advantages to be gained through cooperation with the Biological Survey. These men are trained experts in the work of rodent control and besides being invaluable in a campaign of demonstration and educational work of this nature their services are absolutely free, their salaries and expenses being paid by the government. Commissioner Christierson of San Luis Obispo was the first to avail himself of this valuable assistance and conducted a most successful two-weeks campaign in his county in conjunction with Mr. Jacobsen.

Any commissioner desiring to cooperate in this work should address the Bureau of Biological Survey, Washington, D. C., or W. C. Jacobsen, Biological Assistant, Berkeley, California.

We have divided the county into ten squirrel districts ranging in size from 150 to 250 square miles and appointed an inspector for each.

When our series of meetings are closed on August 7, we expect to have all districts bountifully supplied with poison and sufficient enthusiasm aroused to enable us to make a successful cooperative effort. In anticipation of this, we are sending the following notice to every landowner and renter in this county:

> "*To the landowners of Tulare County:*
>
> The supervisors have generously assisted in the preparations for eradicating the ground squirrels of this county by appropriating funds for the purchase and preparation of poisoned barley in ample quantities which will be dispensed at a dozen or more of the principal towns at actual cost to the county.

> "Realizing that cooperation is necessary for success in this work, and believing that practically all are willing to put forth some effort to rid the county of this curse, we have decided to designate the week of August 13 to 18, inclusive, as 'squirrel week,' and respectfully urge every landowner to assist to the utmost of his ability during that time in eradicating ground squirrels from his property.
>
> "An earnest, cooperative effort of this kind will result in the slaughter of countless numbers of these pests and not only bring immediate relief to hundreds who are fighting to save their crops but lasting benefit to all.
>
> "Tell your neighbor of 'squirrel week' and request his cooperation. If he refuses, tell us and we will use an irresistible argument on him. We have no desire to exercise the authority delegated to us by the new law to compel action, but will not hesitate for an instant to do so if necessary. We mean business and squirrels must go. Do it now!"

We expect remarkable results from this cooperative effort.

We have associated with the squirrels of Tulare County for thirty-one years, and our experience and observation convinces us that we can render her no greater service in return for the many favors she has showered upon us than by improving the opportunity afforded us by circumstances and enforcing, where necessary, the eradication of squirrels from her borders. By eradication we mean, to destroy, to annihilate completely, to wipe out of existence.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF JUNE, 1917.

By Frederick Maskew.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	85
Passengers arriving from fruit fly ports	3,533

Horticultural imports:

	Parcels
Passed as free from pests	157,513
Fumigated	2,321
Refused admittance	73
Contraband destroyed	36
Total parcels horticultural imports for the month	159,943

Pests Intercepted.

From China:
Lepidopterous larvæ in dried herbs.
Larvæ of weevil in sweet potatoes.

From Florida:
Larvæ of *Pontia rapæ* on celery.

From Hawaii:
Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Coccus longulus on betel leaves.

From Japan:
Pulvinaria sp. on unknown plant.
Larvæ of weevil in sweet potatoes.
Fungus on oranges.
Pseudaonidia sp., *Ceroplastes* sp., and *Parlatoria* sp. on unknown pot plant.

From Java:
Weevil in dried ginger.
Fungus on oranges.

From Manila:
Pseudaonidia sp. on beagle nuts.

From Mexico:
Calandra oryzæ and lepidopterous larvæ in seeds.
Asterolecanium sp. on oleander.
Lepidosaphes lasianthi on croton plant.

From New Jersey:
Dialeurodes citri and *Pseudococcus* sp. on gardenia.

From New York:
Diaspis boisduvalii and *Isosoma orchidearum* on orchids.

From Tahiti:
Lepidopterous larvæ in seeds of *Barringtonia* sp.
Lepidosaphes beckii on limes.

LOS ANGELES STATION.

Ships inspected	24

Horticultural Imports:	Parcels
Passed as free from pests	37,292¾
Fumigated	0
Refused admittance	6½
Contraband destroyed	2¾
Total parcels horticultural imports for the month	37,302

Pests Intercepted.

From Arizona:

Chloridea obsoleta in green corn.

From Central America:

Aspidiotus cyanophylii on bananas.

From Japan:

Thyridopteryx ephemeraformis on Thuya obtusa.
Weevil in beans.

From New Jersey:

Green aphis on chrysanthemum plants.

From New York:

Aspidiotus hederæ on *Ceropegia sandersii.*
Diaspis sp. on *Billbergia distachii.*
Diaspis sp. on *Billbergia leopoldii.*
Gymnaspis achmea on *Billbergia sandersii.*
Pseudococcus sp. and *Parlatoria* sp. on lemon plant.
Saissetia oleæ on *Rhipiates rhombera.*
Unidentified coccid on *Virsal* sp.

From Rhode Island:

Green aphis on dahlia roots.

From Texas:

Aleyrodes sp. on Cape jessamine buds.

SAN DIEGO STATION.

Steamship and baggage inspection:	
Ships inspected	17
Fish boats inspected	16
Passengers arriving from fruit fly ports	347

Horticultural Imports:	Parcels
Passed as free from pests	2,492
Fumigated	3
Refused admittance	5
Contraband destroyed	3
Total parcels horticultural imports for the month	2,503

Pests Intercepted.

From Florida:

Anthracnose, Melanose, "Scab," and *Lepidosaphes beckii* on grapefruit.

From New York:

Pseudococcus and *Aleyrodes* sp. on ornamental plants.

From Ohio:

Pseudococcus and *Aleyrodes* sp. on coleus.

EUREKA STATION.

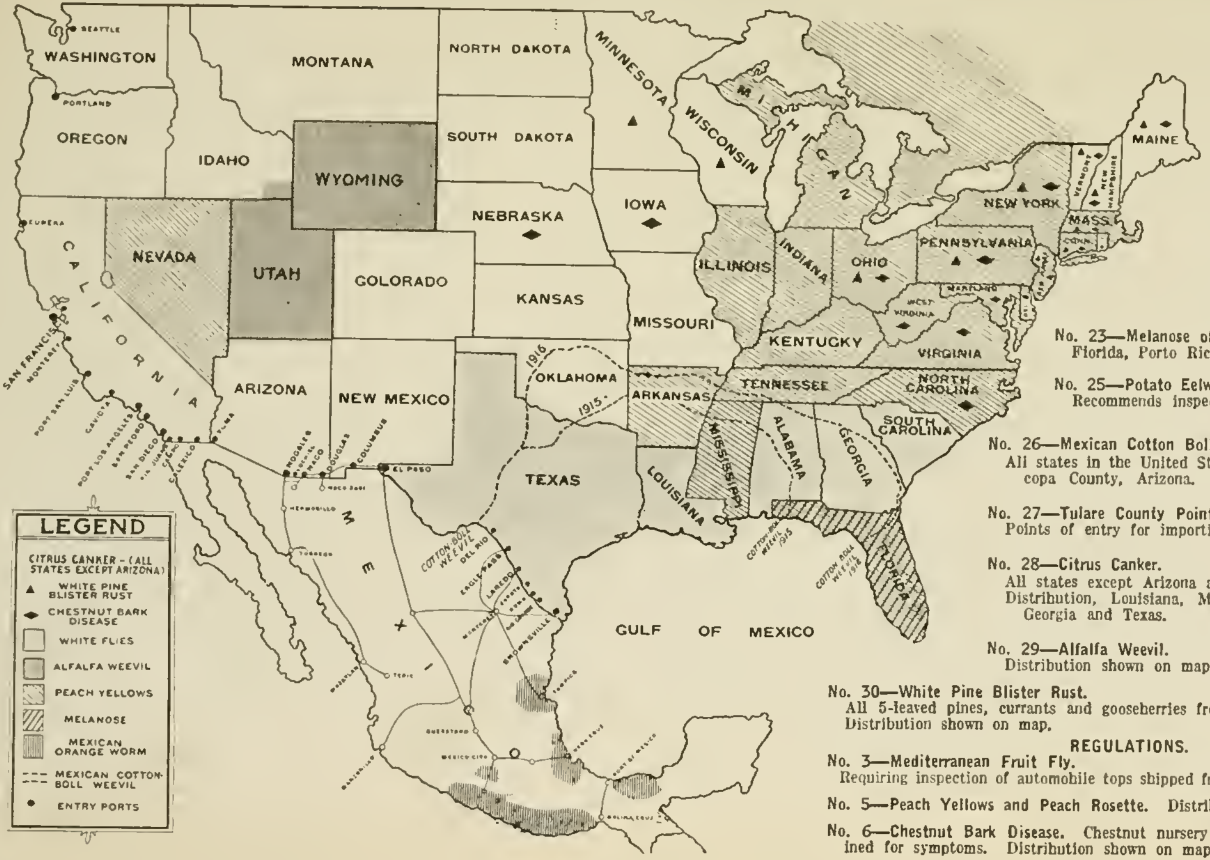
Steamship and baggage inspection:	
Ships inspected	10

Horticultural Imports:	Parcels
Passed as free from pests	2

SANTA BARBARA STATION.

(No report.)

AREAS OF THE UNITED STATES UNDER PLANT QUARANTINE BY ORDER OF COMMISSIONER OF HORTICULTURE.


WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
MICHIGAN
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
MARYLAND
PENNSYLVANIA
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MAINE
MASS.
CONN.
MEXICO
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SEATTLE
PORTLAND
EUREKA
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MONTEREY
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CAVIOTA
PORT LOS ANGELES
SAN PEDRO
SAN DIEGO
TIA JUANA
CALEXICO
YUMA
NOGALES
NACO
DOUGLAS
COLUMBUS
EL PASO
DEL RIO
EAGLE PASS
LAREDO
BROWNSVILLE
COTTON BOLL WEEVIL
1915
1916
LEGEND
CITRUS CANKER - (ALL STATES EXCEPT ARIZONA)
▲ WHITE PINE BLISTER RUST
◆ CHESTNUT BARK DISEASE
☐ WHITE FLIES
▨ ALFALFA WEEVIL
▨ PEACH YELLOWS
▨ MELANOSE
▨ MEXICAN ORANGE WORM
--- MEXICAN COTTON-BOLL WEEVIL
● ENTRY PORTS

QUARANTINE ORDERS IN FORCE.

No. 4—Melon Fly.
Hawaiian Islands, Orleot, Polynesia.

No. 5—Mediterranean Fruit Fly.

Hawaiian Islands, Australia, Southern Europe.

No. 13—Mexican Orange Worm (Fruit Fly).
Mexico.

No. 21—Citrus White Flies.
Distribution shown on map.

No. 23—Melanose of Citrus Fruits.
Florida, Porto Rico.

No. 25—Potato Eelworm.
Recommends inspection only.

No. 26—Mexican Cotton Boll Weevil.
All states in the United States quarantined except Maricopa County, Arizona. Distribution shown on map.

No. 27—Tulare County Points.
Points of entry for importing nursery stock.

No. 28—Citrus Canker.
All states except Arizona are quarantined against. Distribution, Louisiana, Mississippi, Alabama, Florida, Georgia and Texas.

No. 29—Alfalfa Weevil.
Distribution shown on map.

No. 30—White Pine Blister Rust.
All 5-leaved pines, currants and gooseberries from east of Mississippi River. Distribution shown on map.

REGULATIONS.

No. 3—Mediterranean Fruit Fly.
Requiring inspection of automobile tops shipped from Hawaiian ports.

No. 5—Peach Yellows and Peach Rosette. Distribution shown on map.

No. 6—Chestnut Bark Disease. Chestnut nursery stock from all states examined for symptoms. Distribution shown on map.

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- *Clutch Adjustment*
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Persons interested should address Dean, University Farm, Davis, California.

CALIFORNIA STATE PRINTING OFFICE
SACRAMENTO
1917

VOLUME VI No. 10

MONTHLY BULLETIN

Florida grapefruit tree affected with citrus canker. Inspectors are destroying the tree with fire.

OF THE

STATE COMMISSION OF HORTICULTURE

SACRAMENTO, CALIFORNIA OCTOBER, 1917

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THE MONTHLY BULLETIN.

CALIFORNIA STATE COMMISSION OF HORTICULTURE

Vol. VI. October, 1917. No. 10

CITRUS CULTURE IN JAPAN, CHINA AND FORMOSA.

By Curtis P. Clausen.

During the writer's recent trip to the Orient in search of beneficial insects opportunity was presented from time to time to investigate and observe various matters relating to citrus culture in Japan, China and Formosa. Naturally, the methods employed were markedly different from those employed in California, due to various economic factors which will be discussed later. Inasmuch as citrus trees have been grown in the Orient for commercial purposes for many centuries, the practices of the growers have become in a large measure standardized, and it is only in Japan that the results of detailed scientific research have come to be generally utilized. In this article the various methods employed in the different countries will be discussed in due order.

JAPAN.

In Japan, according to Prof. T. Tanakawa of the Okitsu Agricultural Experiment Station, citrus fruits have been grown for about three hundred years and at the present time they are one of the most important fruit products of that country. The producing area extends roughly over a range of about nine hundred miles from Tokyo southwards to Nagasaki. The most extensive plantings are found in Schidzuoka and Wakayama prefectures and the finest quality of fruit is grown in these sections. The official 1915 census gives a total citrus area of approximately seventy-five thousand acres of bearing trees. The annual increase in acreage is very slight as the new plantings are usually about equal to the area from which citrus trees have been removed.

The conditions under which citrus trees are grown in Japan are quite different from those existing in California. The level, fertile lands are used almost exclusively for rice and barley, being considered too valuable to devote to citrus trees. It is for this reason that nearly all citrus is grown upon the hillsides, often being upon steep terraces. In many cases it is necessary to build a stone retaining wall ten or fifteen feet high in order to enclose sufficient soil for a small row of trees. These terraces are irregular in form and are built to conform as closely as possible to the contour of the hillside. This method of planting renders the various operations of cultivating, harvesting, pest control, etc., much more difficult. This disadvantage is in a large part offset by the cheapness of labor, and all work is done by hand.

Climate.

The climate of the citrus belt is, on an average, somewhat colder than that of southern California. Even Nagasaki, at the southern end of Kyushiu, experiences frequent falls of snow during the months from January to March. Since the fruit is harvested during the fall and early winter, injury is very seldom done, though occasionally an extensive leaf drop occurs and the twigs and smaller branches may be injured. This was the case during the past season, which was the coldest experienced in many years. Under normal conditions orange trees in Japan are able to withstand a lower temperature during the winter than in California, this being due largely to the high humidity and the relatively low temperature which usually prevails during the daytime.

Varieties.

By far the most important of all the varieties of citrus grown in Japan is the Oonshu, or Satsuma orange, the area devoted to this variety, according to the government census, being approximately 52,300 acres. The fruit produced, amounting to approximately 165,000 tons per year, represents in value practically nine-tenths of the entire citrus product of the empire. Under normal conditions the price secured by the grower is from three-fourths of a cent to one cent per pound, sales always being made on the basis of weight.

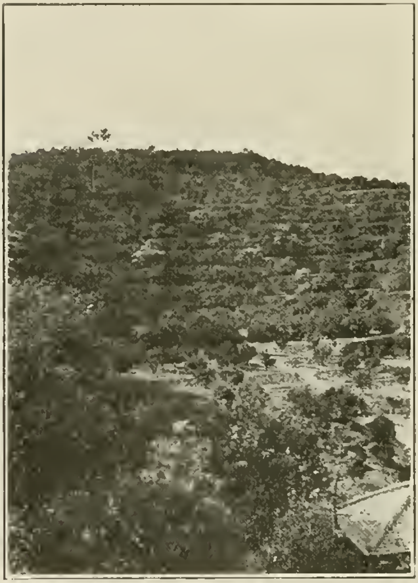

FIG. 124. Citrus orchards in Japan showing the terraced arrangement on the hillsides. (Original.)

The fruit is of medium size, very deeply colored and practically seedless. The skin is comparatively thin and very loose, having a strong tendency towards puffing. Because of this loose skin the shipping qualities are rather poor as compared with the California varieties. The fruit is very juicy and its flavor excellent, it being somewhat sweeter than the Navel orange.

The Navel orange is a comparatively recent importation into Japan, the first trees being started about 1900, and consequently only a few have as yet reached their full bearing capacity. According to the 1915 census, there were about 5,000 acres planted to this fruit. Indications are, however, that this will in time come to be one of the leading varieties in Japan, especially for export.

The Natsumikan, or Japanese pomelo, is quite extensively grown, there being approximately 12,000 acres. This is a fruit somewhat similar in appearance to the California pomelo, though somewhat smaller and slightly flattened at the ends. The flavor, however, is quite distinctive and is considered by many people as superior to that of the California product. One point very much in its favor in Japan is the comparative freedom from injury by citrus canker.

Local Consumption.

The consumption of citrus fruits by the Japanese people has not been great in the past because of their being considered largely as luxuries and also because of a general dislike of any sweet fruit, a crisp fruit with a rather tart flavor being much preferred. This is shown in the case of the Japanese pear, which is very crisp and juicy and, to a foreigner, almost entirely devoid of flavor. Local consumption of oranges, however, is increasing quite rapidly and will undoubtedly result in more extensive production in years to come.

Exports.

In past years large quantities of citrus fruits have been exported to America, Canada, Manchuria and Russia. The quarantine regulations promulgated in recent years by the American authorities against citrus stocks and fruit from the Orient because of the citrus canker have shut off this field of export completely. Naturally this has given rise to numerous protests from the growers of Japan, who, as a rule, do not appreciate the great risk to the California citrus industry from the introduction of this disease.

Cultural Methods.

Because of the irregular terraced hillsides upon which citrus is usually grown, and also because of the relative cheapness of labor, practically all cultural operations are performed by hand. The trees ordinarily are considerably smaller than Navel and Valencia trees of California and are, therefore, planted more closely together. Usually there are about one hundred and fifty trees per acre, but with some varieties the number may be increased to over two hundred. Clean culture is usually practiced, though in Schidzuoka and Wakayama prefectures tea is often grown between the rows. Judging from the appearances of the trees grown in this way, interplanting with tea is not a desirable practice, as the trees were invariably in poor physical condition and produced only a light crop of fruit. Vegetables of various sorts are frequently grown between the trees, and without any noticeable detrimental effects.

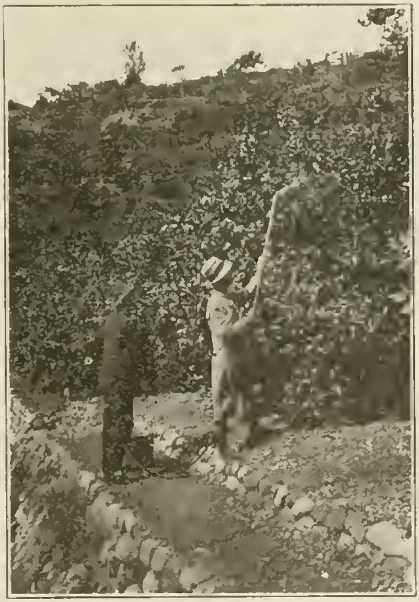

FIG. 125. Pest control in the citrus orchards of Japan. Owing to the steepness and the peculiar arrangement of the terraces power sprayers are not used. The photograph shows a bucket pump in operation. (Original.)

Pest Control.

A great variety of pests are found attacking citrus in Japan, and the problems arising in their control are oftentimes very difficult. Much injury is done to the trees by the citrus canker, the white fly, and various other insect enemies. The canker is often combatted by the use of a Bordeaux spray, applied with a knapsack pump, though with doubtful results. This is the only method of application practicable because of the position in which the trees are grown. Scale control is usually accomplished by fumigation, but this is proving to be a very expensive proposition, as the potassium cyanide, which is still used, costs approximately seventy-five cents per pound. In general fumigation the work is done entirely during the daytime, and oiled paper tents are used instead of canvas. These paper tents are considerably cheaper in initial cost than those made of canvas, but are not nearly so durable and require extensive patching, so that for continuous work the cost of the two types is about equal.

CHINA.

The writer's observations upon citrus culture in China cover only the sections from Foochow southwards to Canton, though citrus is grown quite extensively in several provinces further north. It was not possible to secure any accurate data bearing upon the acreage or production in these provinces because such information is not collected by the government or by any other agency. The methods employed in growing this fruit are practically identical with those used several hundred years ago, as no scientific study of the various problems confronting the industry has as yet been undertaken.

Climate.

The climate of the citrus producing sections of China is in general somewhat colder during the winter than that of southern California and covers a longer period of time. More or less injury to the trees occasionally results from unusually cold weather, but is no more frequent than in this state. The summers are extremely hot and the humidity high during the entire season.

Varieties.

There are three varieties of oranges grown generally throughout China, these being the Ponkwan, or Mandarin, the Suikwan, and the Tankwan. The first-named variety is by far the most extensively grown and is an excellent fruit for local consumption. It is very loose skinned, sweet, and in general somewhat similar to the Satsuma orange of Japan. The Suikwan is not as sweet as the Ponkwan, but has a much tighter skin, which gives it better shipping qualities. The third variety, the Tankwan, is probably a hybrid of the two first-named varieties. It is rather small and with a medium thick skin, and has much the flavor of the tangerine, which it somewhat resembles.

Two varieties of pomelo are grown in the south China section, particularly in the vicinity of Amoy and Swatow. The Matabuntan, or white pomelo, is the best and is more extensively grown than the Toyu, or red variety. The fruits in both cases have a very heavy skin, often one-half inch in thickness, and are very large. A number of fruits in the local market were weighed, and averaged nearly six pounds. The flavor is excellent and quite distinct from that of the California or Japanese varieties. In serving, the skin is first removed and then the tough membrane surrounding each section is taken off, after which portions of the section may be easily removed without breaking the cells.

A considerable proportion of the fruit produced is sold in the local market, the value ordinarily being from 6 to 8 cents each. The fruits are divided and sold in sections rather than as a whole. Large quantities are also exported to various ports on the China coast, usually being transported in bulk by sailing vessels. Often it is necessary to carry the fruit long distances overland, and this is done by native carriers, or coolies, each of whom carries two large baskets on the ends of a pole slung over the shoulder. A single coolie will often carry a load of 200 pounds in this way 20 or 30 miles per day.

Cultural Methods.

The cultural methods employed in China depend largely upon the section in which the trees are grown. In the Foochow district oranges are produced almost exclusively upon the level areas among, or adjacent to, the rice paddies. Inasmuch as these are constantly flooded it is necessary to adopt some means of drawing off the surplus water from the surface soil. As a grove usually comprises only about seventy-five to one hundred trees, this is accomplished by making a large excavation in the center of the grove, this usually measuring nearly one hundred feet in width and about ten feet in depth. The water which accumulates in this reservoir is pumped out from time to time into the adjoining rice paddies. In addition to the above means of eliminating surplus water, the trees when first set out are planted upon mounds about two feet in height. As the trees become older these mounds are increased in size, so that when mature the trees are upon mounds five or six feet high. It can not be said, however, that this practice is satisfactory, as the groves observed were invariably in very poor physical condition and of low producing power. Naturally the quality of the fruit was very poor.

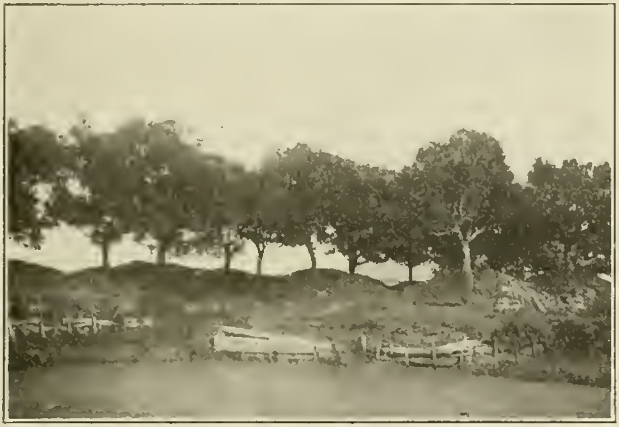

FIG. 126. Orange trees in the Foochow district of China. Note the drainage basin in the foreground. The trees are planted on mounds averaging about two feet in height, but as they grow older the size of the mound is increased. Those shown in the photograph are about six feet in height. (Original.)

The pomelo is largely grown in the river sections above Amoy and Swatow, and the methods of culture employed are quite different from those used in the orange-producing sections farther north. The level lands adjacent to the rivers are devoted almost exclusively to the production of this and other fruits. In these groves clean culture is invariably practiced. The trees were found to be large, heavy bearing and in excellent physical condition, and many of these groves would compare favorably with any found in California.

Pest Control.

The insect pests of citrus are not nearly so numerous or destructive as in Japan and it is very seldom that an infestation becomes bad enough to cause serious injury. One exception to this, however, is a large Cerambycid borer, which does very extensive injury in all sections. The larvæ bore into the trunk and larger branches and often girdle the tree, eventually killing it. Control, when undertaken, is by cutting out the larvæ with a knife or chisel.

FORMOSA.

Citrus culture has not as yet come to be of any commercial importance in Formosa, and the fruit produced is of an inferior quality. The varieties are the same as are grown in China and the original stock was undoubtedly brought over when the island was under the control of that country. No large plantings were observed in any part of the island, most of the trees being in small groups about the houses, etc. One of the best plantings was found at Musha, a small savage village in the center of the island at an elevation of about forty-five hundred feet. The trees were heavily loaded with fruit of rather small size, but none of these were ripe at the time of the writer's visit and the flavor and quality could therefore not be determined.

The agricultural experiment station at Taihoku is engaged in a study of the various citrus varieties in the hope of securing some which will be adaptable to the climatic conditions of the island. An effort was made to establish the lemon in that section, but the trees failed to grow and produce fruit satisfactorily.

THE SELECTION OF PETROLEUM INSECTICIDES.

By ROBERT K. VICKERY, Superintendent Rex Spray Company, Benicia, Cal.

There are a number of useful tests that may be applied to insecticides prepared from petroleum in its various forms. These may be divided into three classes:

(1) Tests to determine the killing power of the oil with reference to the insect for which it is intended.

(2) Tests to determine what injury the oil may do to plants with which it may come in contact. This will not be considered in this paper as Prof. George P. Gray and Prof. E. Ralph De Ong of the California Experiment Station are expecting to publish on this subject.

(3) Tests to determine the efficiency of various methods of applying the oil to the pest, emulsions, etc.

There is much that can be learned by a study of how petroleum kills an insect. The work of Prof. George D. Shafer, published in technical bulletins, Nos. 11 and 21, of the Michigan Agricultural Experiment Station, has changed our conception of how the oil acts on the insect. It has been held for a number of years that death followed the plugging of the spiracles by the viscid oil. That death was not due to suffocation was demonstrated by Mr. Shafer in a series of intricate experiments in which the insects were immersed in pure gases such as hydrogen. He proved that it was some toxic quality in the oil that killed the insect rather than a mere mechanical suffocation due to the stopping of the spiracles.

Mr. Shafer next proved that it was the vapors of the lighter fractions of the oil that were the chief toxic agent. This is logical since the oil need not come in contact with the insect in order to be effective.

From these premises he went on to determine what organ, or system of organs, was affected by the vapor of the petroleum. He found unmistakable evidence that the system of enzymes in the body fluid of the insect was very seriously upset and concluded that this disarrangement was probably the cause of death. He further drew the conclusion that it was the inhibition of the reducing enzymes that was the vital factor. The obvious conclusion was that with the reducing enzymes out of action that the insect was literally burnt up by the freeing of the oxidizing enzymes.

The writer repeated this part of Mr. Shafer's work and came to slightly different conclusions. Good material in the form of silkworm larvæ was used and the reactions were speeded up considerably by the use of liquid air. The conclusion was drawn that insects that had been exposed to the effects of petroleum vapor showed a marked increase in the oxidizing enzymes rather than a reduction of the reducing enzymes. In a histologic study it was found that the œnocytes, which are ductless glands located close to the spiracles and in contact with the tracheæ were very active when subjected to the gases given off by oils. According to Glazer (Biological Bulletin, Vol. XXIII, No. 4, Sept., 1912) these ductless glands are the source of an oxidizing enzyme. The fact that these cells are stimulated to produce more enzymes under the effect of petroleum lends weight to the above opinion. This opinion is not of much value, as under present methods, quantitative work with enzymes, such as those found in the invertebrates, is out of the question.

From the practical point of view, however, Mr. Shafer's work must be considered in the selection of insecticidal oils. It is evident that the oil must have a due proportion of volatile fractions. On the other hand it is just as important that the light fractions be accompanied by a heavy gravity oil in order to keep the volatile portions from evaporating too rapidly. The best killing oil in some cases may be a blend of a light fraction and a heavy lubricating oil, or it may be in other cases an average oil such as kerosene or stove distillate.

The so-called "penetration" of an oil spray depends on the capillarity of the oil. In the case of the armored scale insects, for instance, the oil with the best penetration would be the one that would creep the farthest under the scale covering. Therefore, it is essential that a spray oil should have those ingredients in it that will give it a high degree of capillarity. Capillarity can be measured in the laboratory by means of fine-bore tubes. Professor Gray has devised a method for rapidly testing the relative capillarity of oils. He uses crayon sticks—the common chalk used for writing on blackboards—and by noting the relative heights to which the oils climb and comparing with a water standard he gets a basis for a practical comparison.

So far factors have been considered that can be determined by a physical analysis of the oil. In order to get the right proportion of light and heavy oil it is necessary to resort to field experiments on the insect it is desired to kill. To be accurate these experiments must be on a large scale. In the case of orchard insects rows, plats or acres should be used to compare different samples and not just units of trees or branches. It has been found by experience that laboratory experiments are out of the question.

If all oils were identical in composition there would be nothing further to investigate. Unfortunately they are not and we have much more to learn about their toxicology. Petroleum is a complex mixture of many compounds and series of compounds. It has been found that the oils from different fields and even wells in the same field differ radically from each other. It is absolutely unknown which ingredient or ingredients of the oil contain the toxic qualities. It is no doubt true that in many cases where oil sprays have failed and meteorological conditions blamed that it was the lack of some essential ingredient in the oil that was the real cause of failure. Some day when the division of petroleum into its constituent compounds is practical on a large scale, it will be possible to find out which are the important killing agents. That knowledge will eliminate this factor of doubt.

In the meantime it is practical to find which groups of oils are most effective. Out of many possibilities the following short list will give examples of different oil types that can be compared. Some of these types will prove uniformly more effective than others, thus evading in a practical way our lack of knowledge of the real toxic elements in the oil.

1. Pennsylvania paraffin base crude oil.
2. California asphalt base crude oil.
3. California paraffin-asphalt base crude oil (Coalinga).
4. Pennsylvania kerosene.
5. California kerosene.
6. Crude oil with sulphur compounds.
7. Crude oil low in sulphur compounds.
8. Crude oil with nitrogen compounds.
9. Crude oil low in nitrogen compounds.
10. Crude oil with unsaturated compounds present.
11. Crude oil with the unsaturated compounds removed.
12. Stove distillate with cracked products present.
13. Stove distillate with cracked products removed.

This list could be indefinitely extended by including oils from different localities, other fractions of the oils, and also distinguishing between some of the unsaturated compounds. Field experiments are practical for a comparison of the effectiveness of these different types of oils.

Any experiments on the effect of oils on insects must also consider the effect of oils on the host plants on which these insects live. Plant physiologists tell us that petroleum is more or less injurious to plants. Ultimately it may be found that either the compounds in petroleum toxic to insects are the same as those injurious to plants, or it may be found that they are totally different. Whatever that ultimate discovery may be, at the present time it is necessary when spraying plants to dilute the oil with water by some method. The concentration of oil in water must be the minimum that will kill the insect in order that the injury to the plant may be as little as possible. This fact is one of the axioms of insect control.

This brings us to the subject of the application of the oil to the insect. The problem is simply mechanical where plants are not concerned such as the control of mosquito larvæ, household pests, etc. As stated above where plants are involved some method of dilution with water is necessary, and since oil and water are not mutually soluble, it is necessary to resort to the use of some form of emulsion. The simplest form of an emulsion is the mechanical mixture of water and oil. This involves the use of a machine so constructed that oil and water can be agitated until a momentary emulsion is formed that can be applied to the plant before it breaks into oil and water again. Formerly this method was extensively used, but now its application is limited to the spraying of olives for black scale and for a few other uses.

Most emulsions used for spraying are more or less permanent in character. This permanence is brought about by the addition of a third substance to the oil and water. The simple emulsions in which the drops of oil are merely entangled in the minute particles of some finely divided insoluble substance have been called by Pickering quasi-emulsions. The limoid or calcium hydrate emulsion is a good example. There is a simple gradation through the use of various emulsifiers or third substances from the simple quasi-emulsion to the highly complex true emulsions.

It might be well at this place to define a true emulsion. In this country the study of emulsification has been led by Prof. Wilder D. Bancroft of Cornell University. From his several articles and summaries in the Journal of Physical Chemistry, the following brief statement has been devised. A true emulsion must have three components. There must be two nonmiscible or partially nonmiscible liquids such as oil and water. There must be a third component which is commonly called the emulsifier. One liquid occurs in the form of drops and is said to be in the dispersed phase. The other is the matrix liquid and is said to be in the dispersing or continuous phase. The function of the emulsifier is to form a layer or pellicle around the drops of the liquid in the dispersed phase to keep these drops from coalescing. How the emulsifier performs this function is still a matter of theoretical conjecture. The laws of surface tension account for the formation of the drops and for the pellicles that inclose the drops. The static electric charges on the drops are supposed to hinder coalescence by causing the drops to repel each other. The writer has found that there is heat absorbed in the formation of an emulsion which would indicate a molecular rearrangement. This molecular rearrangement is also shown in the fact that in a true emulsion where there is a maximum of oil emulsified in a minimum of water the viscocity of the resulting emulsion is always greater than that of its component liquids.

There are certain facts that limit the selection of a true emulsifier. The emulsifier must be colloidally soluble in the dispersing liquid. If the emulsion is to be the common one of oil dispersed in water, then the emulsifier must be colloidally soluble in water. The petroleum insecticides belong to this group, as the oil is in the dispersed phase and the water is the continuous liquid. Soap, the usual emulsifier, is colloidally soluble in water. On the other hand it is perfectly feasible to get an emulsion of water in oil. All that is necessary is that the emulsifier shall be colloidally soluble in the oil. The oil companies are greatly troubled by an emulsion of water in oil that forms when they pump crude oil. In this case it is the colloidal substances dissolved in the crude oil, asphalt, etc., that acts as the emulsifier. There is a long list of substances that can act as emulsifiers of petroleum in water. Our choice of an emulsifier of oil for insecticidal purposes is by no means limited to soaps. Colloids as different as iron hydroxide, soluble silica, zinc sulphid, and gelatin gave excellent emulsions. In making a spray emulsion, the emulsifier is added to the water and then the oil added in gradually. If the emulsion is to be very much diluted the oil can be put in all at once. It is necessary to follow this general scheme in order that the emulsion shall have the oil as drops and not the reverse phase.

For spraying purposes an emulsion approaches perfection as the drops become smaller and more uniform in size. One advantage is that the emulsion is much more stable with small even drops. Also under these conditions the application of the oil is more uniform which increases the insecticidal power of the spray. The injury to the plant is decreased because no drops of free oil gather to cause burning.

It is often desirable to know what is the correct amount of a certain emulsifier to add to a given oil. Up to a certain limit the addition of more emulsifier has the advantage of decreasing the size of the drops. After this limit is reached no addition of emulsifier will cause the drops to get any smaller. The minimum size of the drops seems to be a function of the oil. If there is insufficient emulsifier the size of the drops vary and are generally larger than the minimum.

Some idea of the size of the drops can be gained with a compound microscope equipped with an oil immersion lens and an eye-piece micrometer. The emulsion should be under a cover glass on a slide. It is better to separate the cover glass from the slide by the thickness of a ring of quick-drying black asphaltum painted on the slide. It is much simpler to take a microphotograph of the emulsion and study the print. The Dark Field Illuminator improves the definition of the picture. A plate is always a little hazy owing to a slight vibration of the drops. This, however, does not interfere with the accurate calibration of the size of the drops.

The so-called "miscible oils" are a commercial preparation in which the emulsifier is held in the oil either by suspension or by colloidal solution. These miscible oils, when mixed with water make excellent emulsions. It is difficult to make a uniform product and the price at which the oil is sold makes it uneconomical for orchard use.

These principles for the selection of an oil spray were evolved during the course of certain experiments performed in behalf of the Bean Spray Pump Company under an industrial fellowship financed by them in the entomological department of Stanford University. The details of these experiments are the property of the company.

SOME FACTS ABOUT THE ERADICATION OF CITRUS CANKER.

By A. S. Hoyt, Southern Field Deputy.

State Commissioner of Horticulture G. H. Hecke, in order to obtain at first hand a working knowledge of citrus canker and the methods employed in its eradication sent the writer recently to Florida to make a thorough field investigation. Thanks to the courtesy of the Florida State Plant Commissioner Wilmon Newell, the records containing the history of this remarkable campaign from its beginning up to the present time were freely offered for the purpose of making a study in detail. Many interesting facts were noted among which the seasonal variation in the activity of the development of citrus canker deserves mention. It is at once noted that the month of August stands as a high-water mark for the detection of infected trees.

To one who is only slightly familiar with Florida conditions this fact is readily explained as is also the accompanying fact concerning the development of the disease. The warm seasonal rains coming during the latter part of July and August with the consequent period of active vigorous growth bring about an ideal condition for the development of any organisms which may have been present, perhaps for a considerable length of time but which because of climatic or other reasons remained dormant. In August of 1914, 1,313 infected grove trees were found. In August, 1915, this number was slightly exceeded and at the same time the largest number of infected grove trees found in a single month was recorded with the discovery of 1,345 infected trees. Compare with these figures the 219 infected grove trees reported in August, 1916, or the 30 infected grove trees found in August, 1917, and we see a very encouraging and positive assurance that by the maintenance of the present standards of the work, and by the continued cooperation of the United States Department of Agriculture and the State Plant Board of Florida this disease, virulent and destructive though it be, may be completely wiped out.

The eradication of citrus canker is based fundamentally on four factors; first, rigid inspection, second, prompt destruction of infected trees, third, disinfection of persons and things exposed to infection, and fourth, adequate quarantine to prevent the movement of articles, especially nursery stock, likely to carry infection from an infected district into or through a territory which has not previously shown infection. The inspection consists of a careful tree to tree inspection; weekly in infected groves and in groves known to have been exposed to infection, bimonthly in groves in which no infection has been found and which are not known to have been exposed to infection but which by their proximity to infected groves are regarded with suspicion, and quarterly in groves which have not shown infection, are not known to have been exposed to infection and which are distant more than one mile from the nearest infection. The destruction of infected trees is accomplished as promptly as possible after discovery and with every precaution to prevent the dissemination of the bacteria. Beginning with the disinfection of the surface of the ground about the infected tree, then burning with a kerosene torch completely defoliating the tree and blackening with the flame the trunk and branches, grubbing out the tree and carefully working over the soil to obtain as nearly as possible all the roots and then the final spraying of the soil with formaldehyde at the same time thoroughly stirring the ground in order to permit the greatest possible penetration of the disinfectant, and all accomplished with the greatest precision, seems to have reduced to a minimum the danger of spreading the disease.

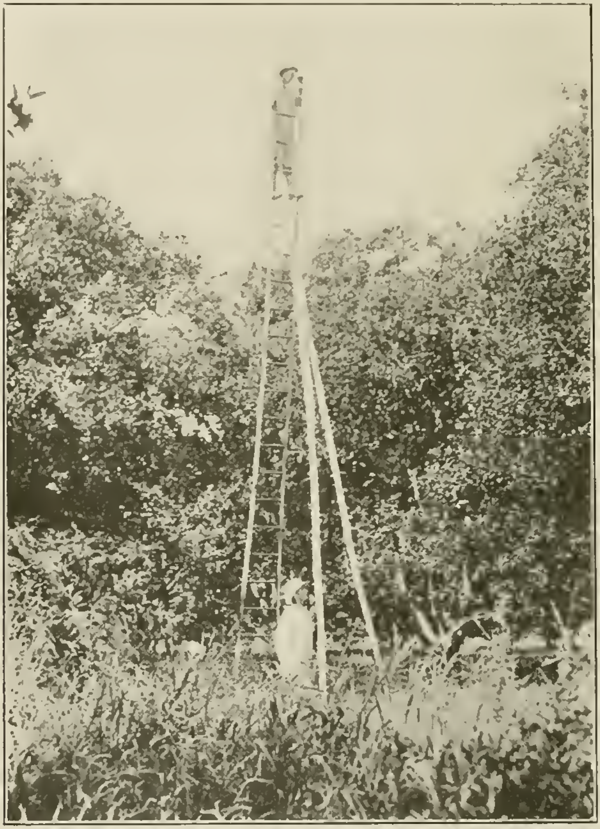

FIG. 127. Inspection of large orange seedlings for evidences of citrus canker. The photograph shows the method of inspecting very tall trees from 26-foot ladders. The men use binocular field glasses. Great care is taken by the inspectors to avoid touching the trees at any time. (Original.)

The disinfection requirements are very strict and are vigorously enforced. Laborers and any persons who find it absolutely necessary to enter infected groves comply fully with the sanitary precautions as required of the citrus canker inspectors, with the difference only, that the inspectors follow the same precautions on entering any property where citrus is grown regardless of whether infection is known to be present or not. A special hat, a one-piece inspection suit, canvas leggings and high shoes compose the inspectors' uniform and completely cover the regular clothing. This uniform is submerged in the disinfectant thoroughly, the hands, face, neck and head are carefully sponged with the disinfectant and this process is carried out unfailingly before and after entering each grove. In passing from grove to

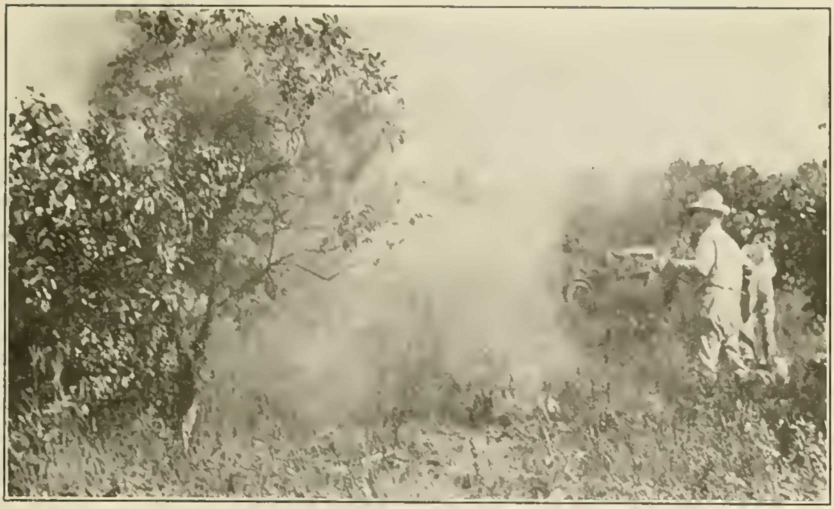

FIG. 128.—Destruction of an infected grapefruit tree by fire, showing the kerosene torch and the bucket pump used for this work. (Original.)

FIG. 129.—The clothing and all parts of the body which are exposed during inspection work are carefully disinfected before and after entering any citrus property. This disinfection is performed regardless of whether the property is infected with citrus canker or not. (Original.)

grove during his recent investigations in Florida the writer was obliged to disinfect or "dip" as many as eight times in one day.

Early in the campaign to eradicate citrus canker from the groves of Florida it was found that these three factors were not sufficient and it became necessary by means of quarantine to control the movement of articles likely to carry infection and which from their very nature were not readily susceptible to disinfection. It was found also that citrus canker bacteria might be present but remain dormant for many months. No amount of inspection could detect an infection of this kind. This danger was especially acute in the case of citrus nurseries where a dormant infection might not be discovered until the nursery stock had been moved, planted out in groves and then a new center of infection developed. To meet this situation the State Plant Board adopted a rule establishing quarantine zones about infected properties. These zones contain all that territory within a mile in any direction from the outside boundaries of a grove in which infection is found. The movement of citrus nursery stock from nurseries situated within such a mile zone is prohibited to points outside such zones. On the preservation of this quarantined area about infected groves, on the strict enforcement of the necessary sanitary precautions, on the continued and careful inspection to find and destroy as quickly as possible the infected trees depends the success of the campaign to eradicate citrus canker.

THE PEAR WOOLLY APHIS.

By W. M. Davidson,[†] United States Bureau of Entomology, Deciduous Fruit Insect Investigations, Sacramento, Cal.

Introduction.

Owing to great similarity in general appearance the woolly aphis of the pear (*Eriosoma pyricola*, Baker & Davidson)[*] (1) has until recently been confused with the woolly aphis of the apple (*Eriosoma lanigera*, Hausmann). To the naked eye the two insects are hardly distinguishable, but the assistance of a magnifying lens shows that the wax threads on the pear species are stiffer and stouter than those on the apple insect, while the body color of the former is, except in newly-molted individuals, considerably paler than that of the latter. The pear species is also much more elongate in form.

Unlike the woolly aphis of the apple which occurs both above and below ground the pear woolly aphis infests only the subterranean portion of the pear tree, the woolly aphis sometimes encountered on limbs of certain varieties of pears, *e. g.*, Winter Nelis and Easter Beurre, being *Eriosoma lanigera.*

The project embracing the investigation of the pear woolly aphis was undertaken at the instance of Dr. A. L. Quaintance, Bureau of Entomology, in charge of deciduous fruit insect investigations. The studies were made principally at Walnut Creek, California, during the years 1915 and 1916. The writer wishes to express his thanks to Mr. R. L. Nougaret, Bureau of Entomology, for helpful suggestions, to Mr. V. G. Stevens for his services in field and laboratory while employed in the Bureau of Entomology, to Mr. George P. Weldon, California State Commission of Horticulture, to Mr. F. C. Reimer, superintendent Southern Oregon State Experiment Station, and to the county horticultural commissioners within whose territories the woolly aphis exists, for helpful cooperation.

Distribution.

The insect has without doubt existed in California for over twenty years and is now established throughout the pear-growing sections of northern and central California. According to reports received from county horticultural commissioners, it does not occur south of Tehachapi Pass nor in the region of the southern end of the San Joaquin Valley. In these districts the acreage in pears is relatively small. In the Santa Clara and San Ramon valleys, throughout the foothill regions of the Sacramento Valley and in the "delta" section the aphis is abundant. In southern Oregon the insect is widespread and the damage is similar to that caused in California. The insect has been taken in Ohio on pears the year after they were imported from Europe, while galls on the alternate host, the elm, have occurred in

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[†] Published by the permission of the Secretary of Agriculture.

[*] Figures in parentheses refer to "Literature Cited" at the conclusion of the article.

Maine (2). Our species is quite probably identical with the European pear woolly aphis (*Eriosoma lanuginosa*, Hartig), but not sufficient European material has been obtainable to make this point a certainty.

Injurious Aspects.

The injury occasioned by the root aphids consists in stunting and, infrequently, outright destruction of young trees naturally weak. Naturally vigorous trees rarely suffer beyond the extent of an early yellowing and dropping of the leaves. Older trees sometimes show a stunting in the branches and early defoliation, but the amount of injury suffered by trees with a well-established root system is obscured by reason of the weak indications. Long and persistent study might show some effect on the quality of fruit, but our present knowledge on such possible effects of aphis work does not lead beyond theorizing.

Woolly aphis injury is closely connected with soil conditions, the greatest amount of damage occurring on heavy soils which become hard and dry after midsummer. Trees on such soil presumably lack adequate moisture in the early fall when the aphis is most abundant and they succumb to the combination of drought and aphis, although normally the pear is capable of standing considerable dryness and uninfested trees under normal orchard conditions pass through this period of drought. On the lighter soils of sandy and gravelly types sufficient moisture is conserved to enable infested trees to pull through. A like result obtains in irrigated orchards, but the irrigation itself checks the aphis but little, rather serving to invigorate the tree.

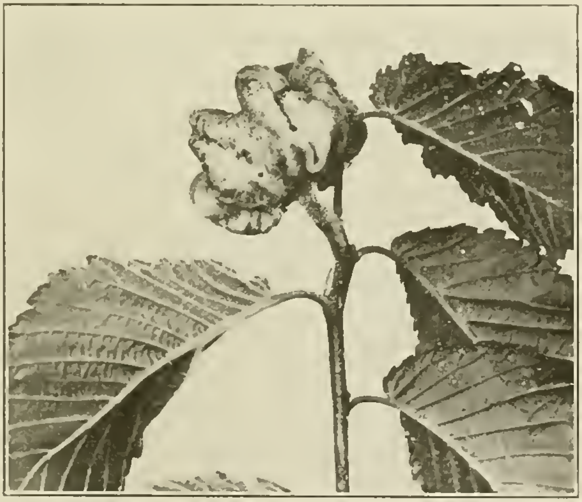

FIG. 130. *Eriosoma pyricola;* mature gall on cork elm leaf. (Original.)

The insects confine their attention almost wholly to the fibers and smaller roots, rarely infesting roots over half an inch in diameter. In this respect their feeding habits differ from those of the apple woolly aphis, which abundantly colonizes large as well as small roots. On pears the fibers are often heavily infested. Weldon (3) found fiber infestations to a depth of three feet. Serious infestations occur in late summer and fall at the bases of the current year's root growth and it is at this point that the fall-winged migrants are chiefly produced, often in great quantities. The aphids form their colonies in rings around the root, greatly weakening if not being instrumental in killing it. The two-year-old wood is likewise attacked, but much less often. It would appear that the nymphs of the migrants do more collective damage than do those of the wingless form. Roots on which large numbers of migrants have developed are very susceptible to decay through the rains of the winter following their infestation. This is presumably due to the impairment of the outer tissues inviting decomposition and is a condition often encountered on heavy soils.

As concerns the woolly aphis the critical period in a pear tree's existence is that preceding the establishment of its root system in the orchard, and of this period the most critical time is the summer and fall following the planting of the tree in the orchard. On heavy soils there is still danger for three more years, yet every succeeding year finds the roots of the tree more firmly established and the danger from aphis diminishes with time.

Seedlings disinfected before planting in spring are liable to bear heavy infestations at any place on their roots the succeeding fall, due either to having been planted in the nursery close to infested trees or to having received spring migrants from cork elms, a phenomenon which is discussed below. The spread of the aphis in nurseries is frequently rapid. The second year in the nursery may find abundant aphis on the trees now grafted. Nursery trees supplied with plenty of water and cultivation are rarely badly injured. When the trees are planted out in the orchard in the third or fourth year of their life they receive as a rule considerably less moisture than they were given the years previous in the nursery and are hard pressed to withstand a heavy infestation of aphis, especially on hard soils. This is the critical time in the existence of the tree and emphasizes the need for careful disinfection of stock before planting. Even if the trees are planted clean there is danger of infestation in June and July through the agency of the spring migrant form if cork elms occur in the neighborhood. The extent of this danger can not be measured accurately, but it is not great enough to justify foregoing the disinfection of infested nursery stock even if this is destined to be planted in close proximity to cork elms regularly infested with woolly aphis.

The French stock which has been used heretofore in the great majority of California pear orchards is very susceptible to aphis injury. The Kieffer, Japanese pear and quince stock are much more resistant, although the insect will thrive upon the two first as successfully as upon the French root. The relative immunity enjoyed by the Japanese stock has of late years led to its adoption in place of the French stock by many nurserymen. Wisker (4) reports on the resistance qualities of this root as found in the Loma Rica Nursery at Grass Valley, California.

Biology.

The life cycle of the pear woolly aphis is complicated, by reason of the fact that it has an alternate hose, the cork elm (*Ulmus suberosa*, Doud). The aphis remains on the pear all the year in succeeding generations of wingless forms, but large numbers of those individuals developing between July and November mature as winged insects, forsake the pear roots, issue above ground and fly to elms, to deposit on the trunks about eight young, male and female. These take no food, molt four skins in about ten days and then the sexes mate, after which the female deposits in a crack of the bark or under a bud scale a single egg. The mature sexual insects are very small and bare. The male is dark green with a lilac mottling, the female orange or crimson. The egg is reddish. If healthy this egg hatches the following spring, generally in April, and the resultant aphis proceeds to settle on a young elm leaf. Its continued puncture in the tissue causes an abnormal growth of the leaf in the form of a thick-walled spiral gall, at first tightly closed. This gall grows larger for about two months, latterly becoming large and bag-shaped, wrinkled and ribbed on the outside and often includes the whole leaf. Mature galls vary in size and may measure as much as 4½ inches maximum diameter. When daily exposed to sunshine they assume bright yellow and rosy hues. Galls that are hidden from sunshine remain green. In the fall all the galls turn brown before the rest of the leaves and most of them remain hanging on the trees throughout winter. This phenomenon is perhaps due to the fact that the peduncle of a gall-bearing leaf is greatly thickened and coupled with its abnormal weight presumably enables the leaf to withstand winds.

The aphis born from the egg lives its whole life in the gall and is the parent of a large progeny, most of which develop wings and forsake the galls in June and July. These are the spring migrants and they fly to pear trees, where they locate sometimes on the foliage, but more usually about the crown. They deposit about twenty-two young on a trunk and these strive to make their way down to the roots. The progeny of the spring migrant do not differ in structure from those of the wingless root form. They remain wingless and have the same habits as all the wingless root aphids. Hundreds of migrants are produced in the larger galls, but the developing nymphs have many natural enemies. Although the galls are tightly closed at first, they open up when about half grown so as to permit entrance of predatory insects. Large numbers of the spring migrants become the prey of spiders, which are often abundant about the elm tree.

Judging from the number of trees planted and flourishing today the cork elm has been a favorite shade tree along roads, about ranch buildings and in towns in California. The aphis has thus been furnished with propitious conditions for its full development. There is little doubt that both spring and fall migrants can migrate comparatively long distances. The writer has found both forms well over a mile from their respective localities of origin and feels reasonably sure that they can travel much greater distances. Both forms are somewhat elongate, bare, dark green or brown, the disc of the abdomen shining and the body tipped with a small tuft of white "wool."

The Root-Feeding Form.

Relative abundance throughout the year.—During the winter months from December to March the aphis is scarce, occurring mostly on fibers. On trees which have been heavily infested the previous summer it is frequently hard to locate any aphis in winter. In April and May the numbers increase regularly. Occasionally, however, on lighter soils quite heavy infestations are encountered early in April. After May the increase in numbers is more rapid until September when the maximum numbers occur. In this month there is the greatest production of winged aphids and thereafter the numbers dwindle rapidly, although it happens at times that the production of migrants and maximum infestation is postponed as late as the end of October. As a rule relatively more migrants are produced in heavy than in light soils, and, therefore, in the latter there is a less noticeable diminishing in numbers, following the development of the migrants.

Biologic observations.—To secure laboratory data on the reproduction, development and habits of the root aphids so that conditions might approach those of nature the insects were bred on root sections kept in moist sand in a cellar. Almost invariably the aphids if disturbed moved off and refused to settle again on the desired piece of root and, therefore, unless they were let alone records could not be secured. This resulted in many incomplete records, as the small roots dried up and the insects departed before full development or before the deposition of the full quota of young. Individual reproduction varied from 90 young in 33 days to 18 young in 28 days. The average number deposited by an individual was 40 and the daily average 1.6, yet on several occasions 7 and in one 8 young were extruded within 24 hours. Toward the end of the deposition period days were frequent on which no young were deposited, and this explains the small average daily reproduction.

The newly-hatched root aphis is elongate in shape, yellowish pink in color, and bare. After a few hours' feeding rows of little white wax tubes appear over the body. These grow into hollow filaments and attain their maximum length not until several days have elapsed. The wax filaments or threads in the first instar may become as much as eight times the length of the aphis. Just preceding each molt these threads break off at the base and after the skin is molted the body is quite bare and the threads grow out anew. In the later instars the threads are never over three times the length of the insect's body. Four molts occur before the aphis is mature and after each molt the color of the newly-molted individual is darker than at the one previous so that the adult insect is at first reddish brown. It is elongate pyriform in shape and about two mm. in length and one mm. maximum width. The body color soon becomes pink, and later, preceding the insect's death, turns dark red. Not until four or five days after the molt do the wax threads attain their full length, which is barely twice the length of the aphis. The threads have a tendency to curl and split at the end, and when not forecasting a molt their breaking off at the base is a sign that the aphis is getting inadequate nourishment or is moribund.

During the winter months the root aphis is in a state of virtual hibernation. Specimens in all stages of growth collected in December showed no activity until February, when the larvæ molted and the adults began the deposition of young. The insects pass the winter in any stage, but it is hardly a true hibernation, rather an unusual prolongation of stages and cessation of reproduction. During the spring months the aphids developed in an average of four weeks varying from 20 to 35 days. In June this period was hardly shortened, but in July, August and September the average dropped to 18 days with a minimum of 13. In

October the developmental period increased again to 25 days, in November to 5 weeks, while in the winter months it was prolonged to 2½ months. The rate of growth is at all times closely dependent on the condition of food coupled with influences of temperatures. The first instar is invariably the longest; generally it is nearly twice as long as any of the other three larval instars, which are of about equal length, but frequently in the breeding dishes the young aphids had trouble finding desirable locations and lost considerable time in becoming settled, thereby prolonging the period of the initial stage to a considerable extent. Once the larvæ became settled they did not move away unless the quality of their food deteriorated.

All attempts to colonize apple or cork elm roots failed, yet the apple woolly aphis was raised on pear roots, French, Japanese and Kieffer; but it appeared that they did not develop as successfully on these as upon apple roots, and no swellings were caused to form on the pear roots. The pear woolly aphis was raised with as good success on Japanese and Kieffer roots as upon French. In most cases it failed to feed on quince roots.

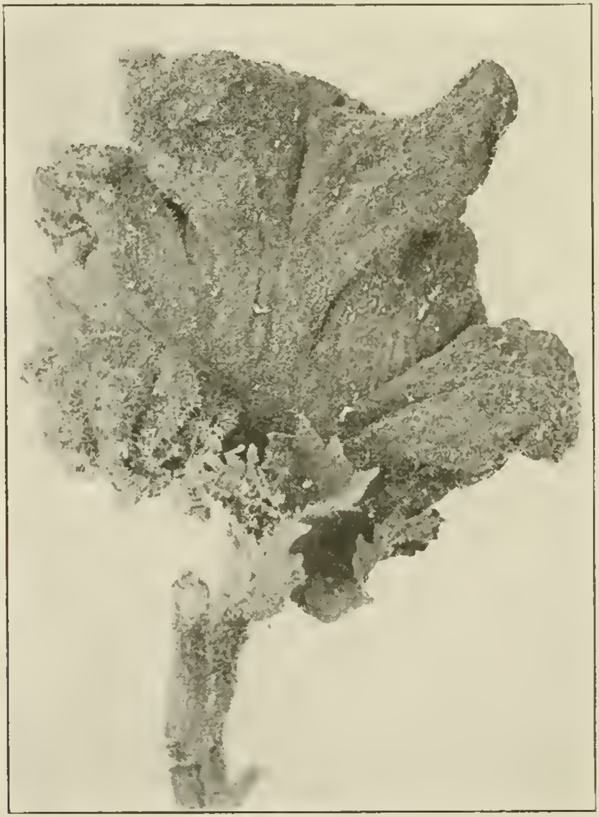

FIG. 131. *Eriosma pyricola:* old dry gall on cork elm leaf. (A. C. Baker.)

There are as many as ten wingless generations a year on pear roots. Compared with other aphids the rate of reproduction is slow, yet this rate does not compare unfavorably with that of the apple woolly aphis. Baker (5) found that the wingless females of this species deposited on the average 30 young at the rate of 3 per diem. The pear woolly aphis feeding on roots somewhat below the average in quality averaged 40 young at the rate of 1.6 per diem.

The root aphids suffer but little from natural enemies, a single *Scymnus* larva being the only predator observed by the writer, while no parasitic enemies were ever encountered. The young larvæ are very flat and without doubt penetrate the soil throughout the root system. Also the aphids can live under extremely moist conditions, provided the roots are not decayed.

Control.

Trees may be safely disinfected in airtight houses or boxes with hydrocyanic acid gas. Three quarters of an ounce sodium cyanide or one ounce potassium cyanide should be used for each 100 cubic feet of air space within the fumigatorium and fumigation should last 45 minutes. For orchard treatment a contact insecticide that will dissolve the wax secretions is desirable. This should be applied in a shallow basin around the trunk. Experiments with miscible oil, kerosene oil emulsion and distillate oil emulsion proved successful. Miscible oil was used at strengths of 1/12, 1/20, 1/28, and 1/40. The two first proved successful and the third partially so. At strengths of 1/12 and 1/20 occasional burning of surface roots resulted, but the main roots escaped injury and for three months after treatment the infestations remained very small. Kerosene oil emulsion was tested at three strengths, 10, 15 and 20 per cent. Three months after the applications all the treated trees with one exception were free from aphis to a depth of one foot, the exception consisting of one small colony on a tree treated with 15 per cent emulsion. Three check trees were heavily infested. At 15 per cent and 20 per cent strengths some surface roots were burned. Treatments with distillate oil emulsion included strengths of 1½ per cent, 3 per cent, 4½ per cent and 6 per cent. Yearling orchard trees were given one gallon of wash. Except for the weakest strength results showed that the aphids were killed as far down in the soil as the insecticide penetrated, in most cases all the insects on the tree were destroyed. In other cases, however, those on the lower roots were not killed and it was evident that one gallon was not quite sufficient to reach the lowest roots.

Carbon bisulphide 30 cc., 20 cc., and 10 cc. per tree was applied with a *pal injecteur* to yearling orchard trees. Each application was made from 8 to 12 inches from the tree trunk, was of 5 cc. charge, and was released 6 inches below the soil surface. The condition of the soil was good for this treatment. Examination made ten days after treatment indicated that 10 cc. was not satisfactory, and that at the two other strengths the aphis were either killed or weakened and discolored, except that out of the four trees treated with 20 cc. one had a small healthy infestation on fibers 14 inches from the soil surface. The use of carbon bisulphide in the orchard is somewhat risky, occasional trees having been killed outright from treatments of 30 cc.

Nursery seedlings treated with one injection of 6 cc. carbon bisulphide injected six inches from the trunk and about five inches below the soil surface were freed of aphis. Even as small a dose as 2 cc. destroyed all the aphids on 5 out of 6 trees. Injections made one foot from the trunk were ineffective. The seedlings were treated in October and no ill effects on the trees could be traced to the insecticide. However, at this time of year the trees were growing but little, and had they been treated earlier in the year when the trees were in full growth root injury might have resulted. If nurseries are to be treated in summer with carbon bisulphide a few trees should first be tested for possible injury.

The writer believes that trees infested with the woolly aphis should receive treatment in April or May and should be examined during July and August and if necessary treated again. In most cases a single application will not kill or drive off all the root aphids on a tree so that in course of time the infestation will increase again. In the treatments with kerosene oil emulsion and miscible oil it was found that this subsequent increase was very slow—three months after the application in no case could an infestation of injurious proportions be found. A yearling orchard tree requires from 1½ to 2 gallons of insecticide, older trees up to four years require about a gallon for each year of their age, but the amount varies with the manner of root growth, trees with deep roots requiring more wash than those with shallow roots. Trees over four years of age rarely need treatment and thorough treatment of them is rendered difficult by reason of the spread of the root system.

Summary.

The pear woolly aphis is distributed throughout the pear-growing districts of northern and central California.

Injury of marked degree is chiefly confined to trees under five years of age; trees the first and second years of their existence in the orchard suffer most severely, the more weakly individuals either being killed outright or more often exhibiting degrees of stunted growth.

The injury is most severe on heavy soils that bake in summer and least severe on sandy soils.

The aphis lives the year around on the roots of pear, but may also spend the winter and spring months on the European and cork elms, where it forms characteristic baglike galls on the leaves. The journey from pear to elm and vice versa is performed by winged aphids which are capable of traveling considerable distances. The wingless forms on the root develop very slowly in winter and in midsummer develop in as short a time as two weeks. In spring and fall the developmental period is roughly a month, but varies according to season.

Miscible oil, kerosene oil emulsion and distillate oil emulsion were used at proper strengths with success in controlling aphis on the roots of young orchard trees. Carbon bisulphide injected into the soil in liquid form with a *pal injecteur* proved satisfactory, both on young orchard trees and in the nursery. There is some danger to the trees in the use of this insecticide.

The application of manure around the trees on the soil surface helps to conserve moisture and assists in combating the aphis on heavy soils with a baking tendency.

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THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical and other publications of a similar nature.

G. H. HECKE, State Commissioner of Horticulture----------------------------Censor
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Entered as second class matter December 29, 1911, at the post office at Sacramento, California, under the act of June 6, 1900.

Mealybug Control.

Through the efforts of the citrus growers of southern California the State Board of Control, with the approval of Governor Stephens, has set aside from their emergency fund the sum of $5,000 for the use of the Commissioner of Horticulture in the mealybug campaign. At the time our budget was submitted in the fall of 1916, the urgency of work against the citrophilus mealybug was not apparent, hence was not included in our estimate. The action of the Board of Control in coming to our rescue is greatly appreciated by the growers, as is shown by numerous letters and telegrams which we have received. The fund will be mainly expended through the branch insectary and will be used first in work with natural enemies and the control of the Argentine ant, and, secondly, in a demonstration of orchard control methods in cooperation with the Citrus Experiment Station, under the direction of Professor Quayle. We expect to appoint an experienced field man who thoroughly understands the citrophilus mealybug, and place him directly in the orchards. The Commissioner of Horticulture will be responsible for parasite and ant work, the Citrus Experiment Station for orchard control. We believe that this arrangement will prove of greatest economic value to the growers whose orchards are infested, since the entire field of control will be covered thoroughly.

G. H. H.

Crop Reports.

With an organization consisting of forty-seven county horticultural commissioners, in as many counties of the state, who are required by law to make reports to the office of the State Commissioner of Horticulture when requested to do so, this commission is in a position to secure data that perhaps could not be gathered through any other source. At times, as would naturally be expected, the accuracy of certain reports is questioned. This, we believe, should not deter us in our effort to get these reports before the public, but should simply put us on our guard so that we may be able to detect inaccuracies and to perfect our system, profiting as we go along by the unavoidable errors which are occasionally made.

For the past four years the task of compiling this report has been in the hands of Chief Deputy George P. Weldon. The work has been simplified and systematized so that early each month a comprehensive report of the crop condition is compiled covering each county where a commissioner is employed; and also in addition two counties having no commissioner, viz: Solano and Napa. In these two cases Farm Advisers J. W. Mills and H. A. Baade have very kindly rendered a similar report to that received from the commissioners. Mr. Butler has recently been appointed commissioner in Napa and we hope to soon have Solano County again represented by a commissioner.

A new feature of the report printed this season is a state average condition. This average is based on the relative production of each fruit in the different counties, and is therefore a true state average. Another year an interesting comparison can be made between the state average at any given time during the season and the same time the previous season.

In addition to the condition report issued, a revised table of the acreage of each fruit, both bearing and nonbearing, is printed for each county. An attempt will be made to secure for the first time this season accurate figures on the production of every fruit grown in the counties represented in our crop report. If this attempt succeeds and similar figures can be secured each season for a series of years, the condition report will be more and more valuable as figures can be given showing what constitutes a normal crop. G. H. H.

Lemon Outlook Better Than First Reported.

The California Fruit Growers Exchange, through Assistant Manager Drezell, has reported to this office that the lemon trees have bloomed since the heat wave and from March on fruit from this bloom will be produced. According to Mr. Drezell pickings during the early months of 1918 will be extremely light, as the fruit that would mature then was very small in size at the time of the excessive heat, and dropped off to a great extent except in districts very near to the coast.

G. H. H.

Spray Injury.

There appears in this number of the Bulletin an article on injury to apples from sulphur sprays, by County Horticultural Inspector J. B. Hundley of Yucaipa. This article brings out very clearly the fact that under certain climatic conditions, and when trees are low in vitality, injury may result that is very severe. In case of injury there is usually a correlated complaint in the nature of an attack upon certain persons who advised the use of the spray which caused the injury. Naturally it is an unpleasant experience, to say the least, to have a crop of fruit badly injured in this manner; but the attacks upon those who have given the best information available are often unwarranted. Spraying with any insecticide or fungicide is more or less unsafe, especially during the summer season, and injury from Bordeaux mixture, arsenate of lead, lime sulphur, etc., frequently takes place. Such injury is no argument against spraying without which we could not possibly grow good fruit, but rather is an argument in favor of every possible precautionary measure. The injury described in Mr. Hundley's paper could not have been prevented because the excessive heat was equally responsible with the sulphur. The combination which resulted in so much injury might not happen again for years. There is a well-founded theory that trees develop immunity to sulphur injury as the season progresses providing that they have been treated early in the season with one or more lighter sprays. In other words the maximum strength of a sulphur spray if applied to trees during the summer, that have not been previously sprayed with a lighter dosage, are very apt to be injured.

Frequently the injury, as in the case described by Mr. Hundley at Yucaipa, seems greatest immediately after the burn shows on the foliage and fruit. Later it may be discovered that the loss of all the injured fruit was a means of thinning the crop with a resultant good effect. G. P. W.

Horticultural Quarantine and Citrus Canker.

It would be hard indeed to find a better instance of the value of an adequate quarantine service, with an intelligent and efficient inspection of incoming horticultural products than is afforded by some of the southern states today engaged as they are, in the herculean task of eradicating citrus canker. In Florida since this disease was first discovered and recognized a large force of trained inspectors has been constantly employed in the groves and nurseries. To organize, train and maintain a force of upwards of three hundred men, each man a specialist, has been and is no small task and is a feature of the work in Florida of which any state might well feel proud.

Unfortunately it is seldom given to any of us to foresee the particular form in which calamity proposes to strike. Had it been possible for the fruit grower of Florida a few years ago to look into the future and see his trees attacked by a disease so destructive as to make him willingly consent to the removal of all trees found infected in the hope of saving the remainder, how long do you think it would have taken him to devise a means whereby with only a small part of the energy, time and money which has subsequently been spent, another force of men could have been organized and trained into an efficient and thorough quarantine service having as its duty the exclusion of just such enemies to his continued prosperity as is citrus canker.

It is true, citrus canker was an unknown disease in 1910 when the nursery stock on which it was introduced into Florida crossed the state line and was set out in the citrus growing sections of the state. Granting as a possibility, what is by no means a probability that the trees carrying this disease might have passed the inspection of qualified inspectors there would still remain an item of inestimable value for the work of eradication in the records showing the number of such trees imported, from whence they came and where they found their ultimate destination. Had this information been available for immediate use by the citrus canker eradication forces of Florida in the early days of the campaign the saving in energy, time and money would have many times over offset the cost of maintenance of the quarantine service.

A. S. Hoyt.

COUNTY COMMISSIONERS' DEPARTMENT.

SAN FRANCISCO'S MODEL GARDENS.

By Dudley Moulton, County Horticultural Commissioner, San Francisco, Cal.

San Francisco has in her own way set an example to agriculturists all over the state. There is almost no extended acreage within the limits of the city and county that can be used for agricultural purposes, but there are hundreds of back yards suitable for small gardens. The local Council of Defense knew that the regular plan for an increased planting in a large way could not be applied here, so they started a movement to help city dwellers. Model garden plots were established in many parts of the city. These were intended as object lessons for those having little experience and there has been a remarkable interest taken in these gardens. The produce from the city gardens is being sent to the San Francisco hospitals.

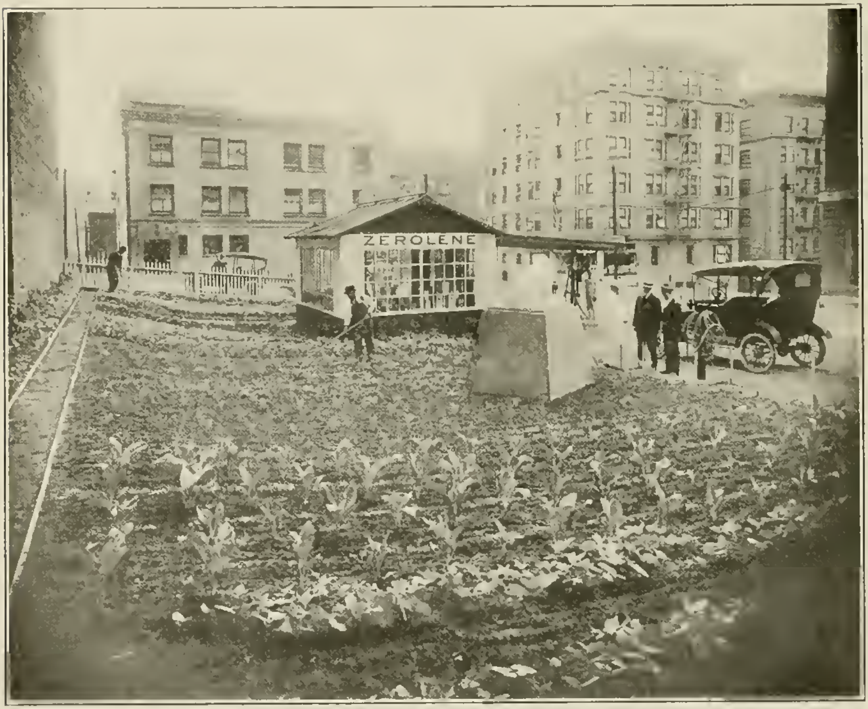

Fig. 132. Model Gardens on the grounds of a Standard Oil service station in San Francisco. The product of Standard Oil Gardens is turned over to the associated charities free. (From Stand. Oil Bul.)

A most remarkable example has been made by the Standard Oil Company. The service stations throughout the city have been models of beautiful lawns and attractive ornamental flowers. Now all stations that had sufficient area are flourishing vegetable gardens and models in every sense of the word. The best science of gardening has been applied. The lawns were spaded under, loam and manure added, a thorough seed bed prepared, and vegetables of all kinds were planted. These were grouped with an idea of rotating crops and of utilizing all available space. All are planted in straight rows and labeled to instruct city dwellers. Now, after seven weeks, vegetables are picked every day and delivered

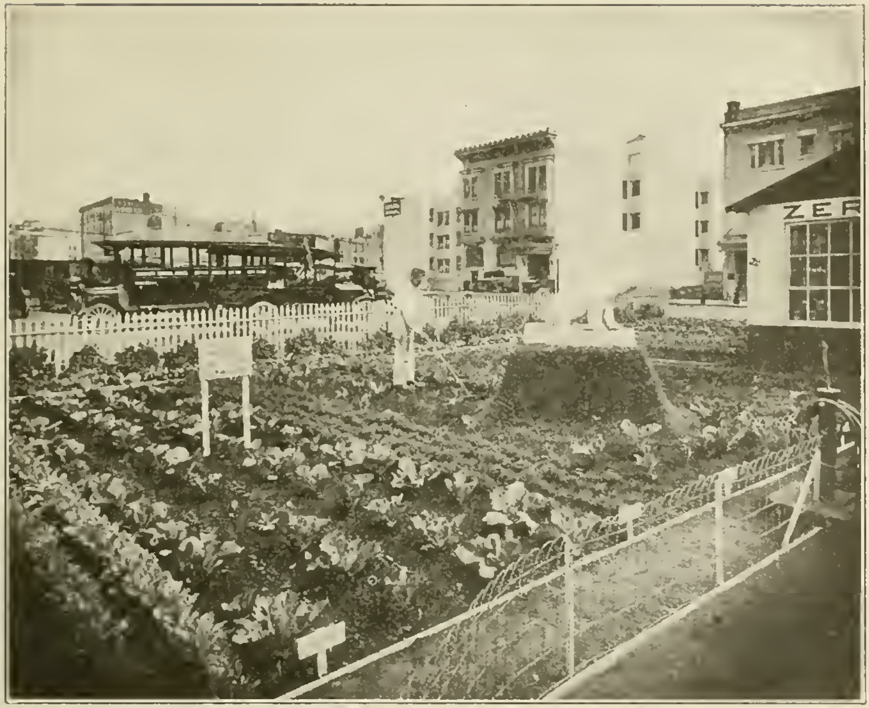

Fig. 133. Service station gardens showing the descriptive signs placed on the plots for the benefit of the San Francisco back-yard gardeners. (From Stand. Oil Bul.)

to the Associated Charities and various other church and benevolent organizations. The Standard Oil Company has done all this at their own expense and donates the produce.

Back-yard gardens have been planted everywhere and a wholesome determination has entered the heart of San Francisco to do her part in producing and conserving food products. While the acreage is comparatively small, still the resulting produce is a large addition to the food resources of the city, for in intensive gardening the principal factor is the labor devoted to the care of the gardens, and San Francisco by planting back-yard gardens is devoting thousands of hours of labor to food production which would otherwise be lost.

SULPHUR INJURY IN YUCAIPA, 1917.

By J. B. Hundley, County Horticultural Inspector, Yucaipa, Cal.

Before entering into a discussion of the points brought out in the following survey, covering every orchard in the Yucaipa Valley which was sprayed before June 20, 1917, it seems wise to state the weather conditions prevailing during the week June 12 to 19. All in this section will remember that the hot wave of that period was unprecedented in recent years. Not only was the temperature 10 degrees higher than ever before known in Yucaipa, but the heat was also accompanied by a desert wind, which was very dry as well as hot. Another unusual feature which rendered the trees more subject to injury was the fact that the hot spell followed a very cold rainy spring. Nearly the entire month of May was cold and wet.

Maximum temperatures—June 5 to 20:

June 5, 80	June 9, 86	June 13, 100	June 17, 112
June 6, 80	June 10, 79	June 14, 106	June 18, 101
June 7, 81	June 11, 81	June 15, 109	June 19, 98
June 8, 90	June 12, 91	June 16, 111	June 20, 92

I am emphasizing these weather conditions because they seem to be the controlling element in this spray injury. During the four years we have been combating codling moth, red spider and mildew, we have used exactly the same sprays each season and have never before burned or injured the fruit in any way. Two cases come to my mind of previous years where sulphur alone caused some leaves to fall. In both cases there was absolutely no injury to fruit, and in both cases the sulphur was applied under hot dry conditions, the temperature being 100 degrees.

During this 1917 spray period, namely, May 28 to June 7, the weather was ideal in that the temperature did not exceed 81. In fact, no injury was apparent until the fifth day of the hot spell, which was from ten to twenty days after the spray was applied.

In the chart only the spray applied prior to June 20 is shown. Those orchards a record of which is preceded by a star did not receive the third spray, but only a second, which followed the calyx spray in about ten days. Other orchards recorded were sprayed twice before the spray indicated, namely, in the calyx and ten days later. In these the date of spray therefore means the date the orchard received its third spray. In practically all cases where injury resulted from either the calyx or the spray ten days later, sulphur was used in the calyx spray, as in Nos. 8, 9, 10. This injury was very much more pronounced on the Rome Beauty than in other varieties and resulted in a small black spot developing around the calyx. It is quite remarkable that this injury should have developed sixty days after the spray was applied. In all cases of injury of fruit in orchards preceded by a star this injury was around the calyx as described.

The damage was estimated shortly after the hot spell and before any thinning, which was absolutely necessary in many cases, had been done. Because of this fact the net returns from orchards with a loss in fruit as high as 20 per cent were not affected, as all injured fruit was removed in thinning and enough was left for a good crop. This spray injury was most severe on the southeast side of the trees. It caused large numbers of leaves to fall and burned the fruit to a crisp, where exposed to the sun. In a week the apples showed burned depressions one-fourth of an inch deep. The stem did not seem to have been injured, so the fruit continued to develop around the burned area until it was badly misshapened. Finally the burned area cracked, but the fruit did not drop.

Another interesting feature brought out is the difference in susceptibility of varieties. The White Winter Pearmain burned the worst, with Gano, King David and Jonathan close seconds. The next most susceptible varieties were Winter Banana, Winesap and Delicious. The Rome Beauty seemed most resistant except in case of the calyx injury described.

Taking up the combinations as set forth in the table, we find that practically every case where sulphur was used injury resulted. The brand of sulphur used, whether "Atomic," "Sul-paste" or "Milled," seemed to make very little difference. In the case of orchards numbered 95 to 100 where dry sulphur was mixed in the spray tank with arsenate of lead and soap, the high per cent of damage seemed due more to the orchard condition, variety of apple and method of application, than to the material. Orchards numbered 114, 115 and 116 were sprayed with dry sulphur also, but with very little injury. In looking over the table you will not find a case where arsenate of lead either alone or with soap caused any appreciable injury. On the other hand orchards numbered 67, 68, 69 and 119 did not have soap in any form and the injury was great. Orchards numbered 57, 60, 62, 81, 82, 83 and 102 all furnish good illustrations of where sulphur was used on part of the orchard, but not on the entire orchard. In these cases the work was done by the same outfit on the same day, but with considerable difference in results.

In the case of orchards numbered 67, 68 and 69 no soap was used, and in 67 and 69 the sulphur was decidedly below strength, still the injury was severe. These few instances will serve to show that the sulphur was the element which seemed to cause the injury. Many other equally interesting instances could be shown of variations due to orchard conditions, locations and vitality of trees if space permitted.

From a careful study of the facts as they appeared it seems that there is an element of danger in the use of sulphur in any form during the growing period. This spraying was all done under favorable conditions which continued for several days. The arsenate of lead-sulphur-soap spray seems fairly safe in dry climates, provided the temperature does not exceed 100 degrees; above that temperature there seems to be an element of risk. Orchards in the lower valleys either sprayed or unsprayed where the temperature was 5 to 8 degrees higher were burned. This indicates that all orchards, sprayed or unsprayed, were very near the point of damage from excessive heat and that in some cases the sulphur proved just enough to cross this line.

Another quite noticeable feature is that the most severe burning occurred on orchards where the vitality of the trees was low. This might have been caused by poorer soil, lack of proper moisture or other unfavorable soil conditions. Two of the worst burned orchards had not been plowed, and consequently were dry.

From the table on pages 404–407 it seems quite certain that this injury was caused by a combination of conditions, namely, sulphur, lack of tree vigor and heat.

Orchard No.	Date spray prior to June 17	Brand arsenate of lead (Amt. per 100 gals.)	Brand sulphur (Amt. per 100 gals.)	Brand soap (Amt. per 100 gals.)	Soil condition	Date last irrigation	Damage
1	May 30	C. Dry, 2 lbs.		Fish oil, 3 lbs.	Fair	1916	None
2	June 4	S. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 3 lbs.	Fair	1916	5%
	June 4	S. Dry, 2¼ lbs.		Fish oil, 3 lbs.	Fair	1916	None
3	June 2	C. Dry, 2¼ lbs.		Fish oil, 2–3 lbs.	Good	1916	None
4	June 1	C. Dry, 2 lbs.		Fish oil, 4 lbs.	Fair	June 15	None
5	May 26	S. Dry, 2 lbs.		Whale oil, 4 lbs.	Poor	June 19	None
6	June 2	C. Dry, 2¼ lbs.		Fish oil, 3 lbs.	Good	June 20	None
7	June 2	C. Dry, 2¼ lbs.		Fish oil, 3 lbs.	Good	June 21	1%
*8	Apr. 20	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	May 5	1%
*9	Apr. 20	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Fair	1916	2%
*10	May 15	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Fair	June 7	1%
*11	May 11	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	June 4	None
*12	May 12	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	June 7	None
13	June 2	C. Dry, 2 lbs.	Atomic, 10 lbs.	Fish oil, 3 lbs.	Poor-fair	June 6	5%
	June 2	C. Dry, 2 lbs.		Fish oil, 3 lbs.	Poor-fair	June 6	None
*14	Apr. 25	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Fair	1916	None
15	June 4	C. Dry, 2¼ lbs.		Fish oil, 2 lbs.	Good	June 18	None
*16	Apr. 30	C. Dry, 2¼ lbs.	Sul. Paste, 10 lbs.	Fish oil, 4 lbs.	Good	June 19	None
17	May 27	C. Dry, 2¼ lbs.	Sul. Paste, 10 lbs.	Fish oil, 4 lbs.	Good	June 1	20%
18	June 6	C. Dry, 2¼ lbs.		Fish oil, 3 lbs.	Fair	1916	None
19	June 5	C. Dry, 2 lbs.		Fish oil, 3 lbs.	Fair		None
20	June 7	C. Dry, 2¼ lbs.			Fair	June 23	None
*21	May 12	C. Dry, 2¼ lbs.	Atomic, 10 lbs.		Fair	June 18	3%
*22	May 11	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Fair	May 12	None
23	June 1	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Alfalfa	May 31	None
24	June 15	C. Dry		Fish oil, 4 lbs.	Fair	June 9	None
*25	Apr. 30	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	June 8	None
*26	May 14	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Fair	June 4	None
27	June 2	C. Dry, 2¼ lbs.		Fish oil, 3 lbs.	Fair	June 7	None
28	June 5	C. Dry, 2 lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Fair	June 22	10%
29	June 6	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	June 22	15%
*30	Apr. 23	C. Dry, 2¼ lbs.		Whale oil, 4 lbs.	Good	June 7	None
*31	Apr. 30	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Whale oil, 4 lbs.	Good	May 18	None
*32	May 15	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Fair	June 14	None
*33	Apr. 23	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	June 15	None

*34	Apr. 25	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.			
	May 10	C. Dry, 2¼ lbs.			Poor	June 2	2%
*35	May 12	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Whale oil, 4 lbs.	Good	1916	None
*36	May 1	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.			None
	May 15	C. Dry, 2¼ lbs.			Alfalfa	May 19	1%
*37	May 2	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.			
	May 14	C. Dry, 2¼ lbs.			Good	June 11	1%
*38	May 1	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Fair	1916	None
*39	May 16	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	June 23	None
40	May 28	C. Dry, 2¼ lbs.		Fish oil, 3 lbs.			None
	June 1	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 3 lbs.	Fair	June 6	10%
*41	May 17	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Fair	June 14	1%
*42	May 13	C. Dry, 2¼ lbs.	Atomic, 8 lbs.	Fish oil, 4 lbs.	Fair	June 14	1%
*43	May 2	S. Paste, 5 lbs.	Atomic, 10 lbs.	Whale oil, 4 lbs.			
	May 14	C. Dry, 2¼ lbs.			Good	June 22	1%
*44	May 16	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	June 10	None
*45	May 14	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	June 3	None
46	May 31	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	June 19	None
47	June 2	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 3 lbs.	Good	June 13	3%
48	June 1	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 3 lbs.	Good	June 12	15%
49	June 1	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 3 lbs.	Good	June 13	5%
50	June 1	C. Dry, 2¼ lbs.		Fish oil, 3 lbs.	Good	May 22	None
51	May 28	S. Dry, 2¼ lbs.		Whale oil, 4 lbs.	Good	June 27	None
*52	May 12	S. Dry, 2¼ lbs.		Whale oil, 4 lbs.	Fair	June 12	None
*53	May 15	S. Dry, 2¼ lbs.		Whale oil, 4 lbs.	Good	June 5	None
*54	May 14	S. Dry, 2¼ lbs.		Whale oil, 4 lbs.	Fair	May 21	None
*55	May 11	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	1916	None
*56	May 5	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	1916	None
57	June 2	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 3 lbs.			5%
	June 2	C. Dry, 2¼ lbs.		Fish oil, 3 lbs.	Good	1916	None
*58	May 11	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	1916	None
59	June 4	C. Dry, 2¼ lbs.	Dusting sul. mixed with soap hot, 5 lbs.	Fish oil, 4 lbs.	Good	June 8	25%
60	June 1	C. Dry, 2¼ lbs.	Dusting sul. mixed with soap hot, 5 lbs.		Poor		15%
				Fish oil, 4 lbs.	Good	June 19	3%
61	May 28	C. Dry, 3¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	June 22	5%-15%
62	May 10	C. Dry, 2½ lbs.	Dry sul. in tank, 5 lbs.				5%
	June 12	C. Dry, 2½ lbs.		Fish oil, 4 lbs.	Fair		None
63	June 2	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	May 25	None
64	June 8	C. Dry, 2¼ lbs.	Sul. paste, 10 lbs.	Fish oil, 4 lbs.	Good	June 4	25%
65	June 5	C. Dry, 2¼ lbs.	Sul. dusted on after spray.	Fish oil, 4 lbs.	Good	June 6	2%

Orchard No.	Date spray prior to June 17	Brand arsenate of lead (Amt. per 100 gals.)	Brand sulphur (Amt. per 100 gals.)	Brand soap (Amt. per 100 gals.)	Soil condition	Date last irrigation	Damage
66	May 27	C. Dry, 2¼ lbs.	Sul. paste, 10 lbs.	Fish oil, 4 lbs.	Good	June 18	15%
67	June 12	C. Dry, 3¾ lbs.	Milled, 2 lbs.		Good		10%, some trees 50%
68	June 1-5	C. Dry, 2½ lbs.	Milled, 10 lbs.		Good	1916	10%
69	June 7	S. Dry, 2½ lbs.	Milled, 6 lbs.		Dry		50%
70	June 6	C. Dry, 3 lbs.	Atomic, 3 lbs.	Whale oil, 2½ lbs.	Good	1916	1%
71	June 8	S. Dry, 4 lbs.	Atomic, 3 lbs.	Whale oil, 4 lbs.	Fair	1916	2%
72	June 5	C. Dry, 3 lbs.	Atomic, 9 lbs.		Fair	1916	None
*73	Apr. 23	S. Dry, 3 lbs.	Atomic, 4 lbs.	Whale oil, 3 lbs.	Fair		None
74	June 4	S. Dry, 3 lbs.		Whale oil, 3 lbs.	Fair		1%
75	June 5	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good		5%
76	June 6	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Poor	1916	None
77	June 6	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Poor	1916	None
78	June 8	C. Dry, 2¼ lbs.	Spray sul.		Poor	1916	None
*79	May 16	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	1916	1%
*80	May 16	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Fair	May 23	None
81	June 4	S. Paste, 5 lbs.	Sul. paste, 10 lbs.	Whale oil, 4 lbs.			5%
	June 4	S. Paste, 5 lbs.		Whale oil, 4 lbs.	Fair	June 19	None
82	June 5	S. Paste, 5 lbs.	Sul. paste, 10 lbs.	Whale oil, 4 lbs.			5%
	June 5	S. Paste, 5 lbs.		Whale oil, 4 lbs.	Good	June 20	None
83	June 5	S. Paste, 5 lbs.		Whale oil, 4 lbs.			None
	June 5	S. Paste, 5 lbs.	Sul. paste, 10 lbs.	Whale oil, 4 lbs.	Good	June 15	10%
84	June 3	S. Paste, 5 lbs.		Whale oil, 3 lbs.			None
	June 3	S. Paste, 5 lbs.	Sul. paste, 10 lbs.	Whale oil, 3 lbs.	Fair	June 12	7%
*85	May 2	S. Dry, 2¼ lbs.		Fish oil, 4 lbs.			None
	May 12	C. Dry	Atomic, 10 lbs.	Fish oil, 4 lbs.	Dry	June 10	1%
*86	May 3	S. Paste, 5 lbs.		Whale oil, 4 lbs.			None
	May 15	S. Paste, 5 lbs.	Sul. paste, 10 lbs.	Whale oil, 4 lbs.	Good	June 13	1%
87	May 28	S. Dry, 2¼ lbs.		Whale oil, 3 lbs.			None
	June 6	S. Dry, 2¼ lbs.	Sul. paste, 10 lbs.	Whale oil, 3 lbs.	Poor-Dry	1916	5%
*88	May 14	S. Dry, 2¼ lbs.	Sul. paste, 10 lbs.	Whale oil, 4 lbs.	Fair	1916	1%
89	June 1	C. Dry, 2¼ lbs.		Fish oil, 3 lbs.	Good	May 30	None
*90	May 12	S. Dry, 2¼ lbs.		Whale oil, 4 lbs.	Good	May 24	1%
*91	May 12	S. Dry, 2¼ lbs.	Sul. paste, 10 lbs.	Whale oil, 4 lbs.	Good	1916	1%
92	June 2	C. Dry, 2¼ lbs.	Sul. paste, 10 lbs.	Fish oil, 3 lbs.	Dry	June 29	3-5%
93	June 2	C. Dry, 2¼ lbs.	Flowers sul. mixed in tank, 5 lbs.	Fish oil, 3 lbs.	Fair	May 26	50%

94	May 28	C. Dry, 2¼ lbs.		Fish oil, 3 lbs.	Dry		None
	May 28	C. Dry, 2¼ lbs.	Atomic		Dry	June 7	35%
95	June 8	S. Dry, 2¼ lbs.	Anchor sul, mixed in tank, 5 lbs.	Whale oil, 3 lbs.	Very dry	1916	50%
96	June 2	S. Dry, 2¼ lbs.	Anchor sul. mixed in in tank, 5 to 6 lbs.	Whale oil, 3 lbs.	Dry	1916	30%
97	June 4	S. Dry, 2¼ lbs.	Anchor sul. mixed in in tank, 5 to 6 lbs.	Whale oil, 3 lbs.	Dry	June 27	25%
98	June 7	C. Dry, 2¼ lbs.	Anchor sul. mixed in in tank, 5 to 6 lbs.	Whale oil, 3 lbs.	Dry	June 18	60%
99	June 5	C. Dry, 2¼ lbs.	Anchor sul. mixed in in tank, 5 to 6 lbs.	Whale oil, 3 lbs.	Dry	June 20	20%
100	June 8	C. Dry, 2¼ lbs.	Anchor sul. mixed in in tank, 5 to 6 lbs.	Whale oil, 3 lbs.	Fair	June 21	45%
*101	May 3	S. Dry, 5 lbs.	Milled, 12 lbs.	Whale oil, 4 lbs.	Good	June 18	15%
102	June 5	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 3 lbs.			15%
				Fish oil, 3 lbs.	Good	June 12	None
*103	May 14	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	June 11	None
*104	May 12	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Good	May 16	None
*105	May 24	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Fair	June 19	None
106	June 3	C. Dry, 2 lbs.		Fish oil, 3 lbs.	Fair	June 9	None
*107	May 11	C. Dry, 2¼ lbs.		Fish oil, 4 lbs.	Alfalfa	1916	None
108	Ju. 7-10	S. Dry, 2¼ lbs.	Sul. paste, 10 lbs.	Whale oil, 3 lbs.	Dry	Never	75%
109	June 1	S. Dry, 2¼ lbs.		Whale oil, 3 lbs.	Fair	1916	None
110	May 24	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Dry	June 4	20%
111	June 2	C. Dry, 2 lbs.			Dry	June 20	None
*112	May 15	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	June 8	None
113	June 2	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	June 1	12%
114	June 5	C. Dry, 2¼ lbs.	Dusting sul, mixed in tank, 9 lbs.	Fish oil, 4 lbs.	Fair	June 20	1%
115	June 4	C. Dry, 2¼ lbs.	Dusting sul, mixed in tank, 9 lbs.	Fish oil, 4 lbs.	Good	June 17	1%
116	June 5	C. Dry, 2¼ lbs.	Dusting sul, mixed in tank, 9 lbs.	Fish oil, 4 lbs.	Good	June 15	None
117	May 29	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 3½ lbs.	Good	1916	10%
118	May 30	C. Dry, 2¼ lbs.	Atomic, 10 lbs.	Fish oil, 4 lbs.	Good	1916	12%
119	June 2	Pyrox	Milled, 10 lbs.		Good	1916	15%

C. Dry—Corona dry arsenate of lead.
S. Dry—Swift's dry arsenate of lead.
S. Paste—Swift's paste arsenate of lead.

WORMY PEARS ARE CONDEMNED IN SACRAMENTO COUNTY.

By Fred C. Brosius, Deputy County Horticultural Commissioner, Sacramento, Cal.

The season of 1917 will always be remembered in Sacramento County for its enormous yield of pears and also the great amount of codling moth worms. The exact cause of this uncommonly large infestation may never be known, as the worms appeared in unusual numbers in many orchards where the several sprayings were carefully done, while in orchards where indifferent or no spraying was done, as high as 90 per cent of the pears were infested at picking time.

About 85 per cent of the entire pear crop from 5,100 acres in this county is shipped by boats to the Sacramento dock, and there transferred into refrigerator cars for Eastern shipment. It is on this dock that most of the fruit inspection is carried on.

About the twenty-third of July the inspectors noticed that the amount of infested or wormy pears, per packed box, began to increase in many of the growers' packs, and as soon as possible these growers were visited and warned to sort the pears before packing. However, by July 29, the infestation per box was so great that it became necessary in several cases to condemn the entire lot and require that it be sorted and repacked on the dock before sale or shipment. This caused the shipping companies much inconvenience and the growers considerable additional expense, but it was thought that only in this way the growers could be brought to realize the true condition of their pack. The number of pears in from one to four boxes in each shipment was counted.

At the close of this article is a memorandum showing the percentage of infestation of each box counted, together with the number of boxes of each shipment condemned. Letters are used to designate shipments instead of the growers' names, each shipment by the same grower being designated by the same letter. It will be seen that some growers cleaned their pack after the first condemnation, while one grower had four different shipments condemned, and ceased shipping wormy fruit only when threatened with arrest.

No pears were condemned after August 10, for many growers, realizing the futility of getting the pears passed by our inspectors, either ceased packing entirely or sent their entire shipment to the canneries.

No arrests were made this season for several reasons, greatest of which was the incompetent labor used both during the spraying season and at harvest time.

It is our intention in the future to endeavor to allow not over 3 per cent infestation in any packed box of pears. However, there is one reprehensible practice which must be discontinued. This is the dumping of these wormy fruits into the local and San Francisco markets. The results of this practice are certainly bad for the careful grower, who sprays well and puts up a good pack, free from worms, but not quite good enough for Eastern shipment, and it is considerably worse for the consumer who expects to buy wholesome fruit, but, unknowingly, obtains an additional bargain in worms.

One fruit-shipping company, after sorting and repacking, and against the remonstrances of myself, shipped 52 lug boxes of these wormy pears to San Francisco. It can be imagined in what condition these arrived, being 100 per cent wormy. Fortunately, the San Francisco Board of Health condemned this particular shipment. To illustrate the feeling of the commission men in this matter I quote herewith a letter from a dealer in San Francisco to State Horticultural Commissioner G. H. Hecke, as follows:

"San Francisco, August 9, 1917.

"As far as we are concerned you can depend on it that we will gladly cooperate with either your office direct or with any office or officer in an effort to properly carry out the letter and spirit of the law referred to. (Standard Apple Act.)

"There is only one point that I regret, and that is that the law doesn't include other fruits besides apples. A mistake was made when pears and other fruits were not included, although there may be a law on the books at present that covers pears. If so, would you be kind enough to give me some reference.

"My reason for asking this is that the market is blocked at the present time with a lot of No. 2 Bartlett pears, not only from the Sacramento River, but from other points as well, and almost all of this No. 2 fruit is wormy, and consequently checks the movement of green fruit that would otherwise sell at a satisfactory price.

"I know that our firm as well as other dealers in this market would be glad if this No. 2 or wormy stock could be condemned, because as matters now stand it permits growers who make a practice of not spraying their orchards to have an outlet for at least a fair market for their fruit, while the grower who pays attention to spraying, etc., has one of the best markets in the United States absolutely shut off from him.

"We claim that if the San Francisco market would not be made the dumping ground for every bit of No. 2 fruit that is raised in this end of the state it would prove to the grower who takes care of his orchard and who tries to put No. 1 fruit on the market that San Francisco would be one of the best markets for him that could be found anywhere in the United States."

Shipper	Date	Worm-free pears	Wormy pears	Total pears per box	Per cent worms	Number boxes condemned
A	July 29	120	45	165	27	115
A	July 29	93	72	165	48	----------
B	July 29	102	55	157	35	80
B	July 29	81	78	169	40	----------
C	July 30	107	73	180	40	67
E	July 30	128	52	180	29	60
D	July 30	134	16	150	10	----------
D	July 30	120	25	145	17	171
D	July 30	124	31	155	20	----------
A	July 30	74	90	164	54	53
F	July 31	55	98	153	65	35
G	July 31	110	48	158	30	80
G	July 31	106	48	154	29	----------
A	July 31	72	91	163	55	91
A	July 31	126	39	165	23	----------
H	July 31	97	68	165	41	145
H	July 31	105	64	168	39	----------
I	August 1	121	43	164	25	67
I	August 1	121	38	159	24	----------
F	August 1	43	120	163	73	60
C	August 1	88	77	165	40	170
C	August 1	72	91	163	56	----------
J	August 2	18	124	142	87	17
K	August 2	134	45	179	25	40
F	August 2	33	132	165	80	36
F	August 2	50	101	151	60	----------
L	August 3	86	47	133	35	71
L	August 3	98	46	144	32	----------
F	August 3	112	53	165	32	20
M	August 3	137	43	180	23	----------
M	August 3	91	72	163	44	180
M	August 3	91	74	165	45	----------
M	August 3	93	70	163	52	----------
N	August 3	102	40	142	28	----------
N	August 3	134	19	153	12	----------
O	August 3	132	31	163	19	----------
O	August 3	133	30	163	19	45
O	August 3	135	37	162	22	----------
P	August 3	146	104	247	42	11
P	August 3	109	143	252	56	----------
J	August 3	12	138	160	86	29
Q	August 4	155	52	207	29	45
R	August 4	104	63	167	37	15
S	August 4	82	43	125	34	103
S	August 4	83	51	134	37	----------
G	August 4	139	16	155	10	72
B	August 4	133	17	150	11	11
B	August 4	126	25	151	16	----------
T	August 4	109	62	171	36	30

Shipper	Date	Worm-free pears	Wormy pears	Total pears per box	Per cent worms	Number boxes condemned
T	August 4	145	20	165	12	
T	August 4	126	29	155	12	61
T	August 4	134	25	159	15	
F	August 5	94	71	165	42	42
F	August 5	71	94	165	56	
U	August 5	106	45	151	29	
U	August 5	110	25	135	19	46
U	August 5	61	62	123	40	
V	August 6	120	38	158	27	96
V	August 6	127	53	180	29	
V	August 6	145	18	163	11	
H	August 6	129	36	165	21	18
D	August 7	133	50	183	27	95
D	August 7	158	22	180	12	
E	August 7	152	20	172	11	190
E	August 7	164	31	195	15	
W	August 8	95	65	160	40	28
X	August 9	134	36	170	21	157
X	August 9	134	45	179	25	
O	August 9	88	75	163	46	13
Y	August 9	140	25	165	15	17
Z	August 10	102	51	153	33	41
Z	August 10	64	48	112	42	
						2,723

Come to the State Fruit Growers' Convention at Sacramento on November 21, 22 and 23, and learn what eastern fruit buyers have to say about standardization of the California fruit pack.

CROP REPORT AND STATISTICS.

MONTHLY CROP REPORT.

(September 1, 1917.)

By Geo. P. Weldon.

Compiled from reports of the county horticultural commissioners.

Counties	Almonds (per cent)	Apples (per cent)	Apricots (per cent)	Cherries (per cent)	Figs (per cent)	Grapefruit (per cent)	Lemons (per cent)	Olives (per cent)	Oranges (per cent)	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	40	50	h	h	#	#	#	#	#	h	h	h	h	100
Butte	15	20	#	h	100	25	#	70	25	30	20	60	75	#
Colusa[1]	60	—	h	#	100	#	—	#	—	#	100	100	110	100
Contra Costa[2]	70	90	50	60	#	#	#	#	#	100	100	40	90	100
El Dorado	#	70	#	#	#	#	#	#	#	80	85	80	90	#
Fresno	#	#	h	#	90	#	90	100	40	90	#	#	#	#
Glenn[3]	70	90	50	#	#	#	95	100	95	80	75	#	80	#
Humboldt	#	80	h	h	#	#	#	#	#	90	90	—	#	#
Imperial	#	#	—	#	—	#	#	#	#	#	—	#	#	#
Inyo	#	65	#	#	#	#	#	#	#	0	0	#	#	#
Kern	#	100	h	#	#	#	#	#	50	55	100	75	100	#
Kings	#	#	h	#	#	#	#	#	#	95	#	#	100	#
Lake[4]	70	100	#	#	#	#	#	#	#	#	100	#	100	#
Los Angeles[5]	50	70	45	#	75	75	60	25	70	100	80	60	#	70
Madera	80	100	h	#	100	#	#	65	#	120	#	h	90	#
Marin	#	40	h	h	#	#	#	#	#	80	90	#	80	#
Mendocino	#	100	—	—	#	#	#	#	#	—	100	#	100	—
Merced	90	#	h	h	100	#	#	100	#	100	#	#	#	#
Modoc	#	95	50	50	#	#	#	#	#	45	75	100	100	#
Monterey	60	75	80	h	#	#	#	#	#	90	90	70	60	#
Napa	#	100	h	h	#	#	#	#	#	100	h	h	110	#
Nevada	#	80	0	h	40	#	#	#	#	60	100	75	#	#
Orange	#	90	h	#	#	#	80	#	80	100	#	#	#	70
Placer	75	70	#	h	--	#	#	70	30	70	50	35	#	#
Riverside	25	100	h	h	#	45	30	25	16	85	75	#	100	80
Sacramento	50	100	85	h	#	#	100	50	50	100	115	100	80	#
San Benito	75	100	h	h	#	0	#	#	#	100	100	#	100	100
San Bernardino	#	95	h	h	#	75	10	35	20	100	#	#	#	75
San Diego	#	90	h	#	#	90	60	40	55	100	100	#	#	#
San Joaquin	100	#	h	h	#	#	#	—	#	100	h	100	100	75
San Luis Obispo	60	60	80	#	#	#	#	#	#	55	40	#	75	65
Santa Barbara	#	100	100	100	#	100	75	50	85	#	100	#	#	100
Santa Clara	#	90	h	h	#	#	#	#	#	80	65	#	72	#
Santa Cruz	#	100	h	h	#	#	75	#	#	80	90	—	95	#
Shasta	h	60	h	h	#	#	#	15	#	38	75	#	65	#
Siskiyou	#	80	#	h	#	#	#	#	#	80	90	95	95	#
Solano[6]	10	#	50	60	#	#	#	#	#	50	100	45	60	—
Sonoma	85	90	75	50	#	#	#	—	#	90	90	75	70	70
Stanislaus	100	#	h	h	110	#	#	60	40	h	h	h	100	100
Sutter	65	100	#	100	60	#	#	70	#	85	100	100	100	#
Tehama	50	50	h	h	50	#	#	40	25	70	50	h	75	#
Tulare	#	#	h	#	100	75	80	65	65	95	#	95	105	#
Ventura	—	#	90	h	#	—	10	—	15	#	—	#	—	75
Yolo	50	75	h	h	80	#	#	65	75	60	75	h	85	80
Yuba	70	90	#	#	90	#	#	80	#	70	100	75	#	#

Reports from Napa and Solano counties by Farm Advisers.

Figures indicate condition of crop in per cent on the basis of 100 as normal.

—Horticultural commissioner has insufficient information for a report.

#Not grown commercially.

[1-6] Report for month of August.

h—Harvested.

Estimated Per Cent of the Normal Fruit Crop Grown in Each of the Main Producing Counties.

Compiled from reports of the county horticultural commissioners, 1915.

Counties	Almonds (per cent	Apples (per cent)	Apricots (per cent)	Cherries (per cent)	Figs (per cent)	Lemons (per cent)	Olives (per cent)	Oranges (per cent)	Peaches (per cent)	Pears (per cent)	Plums (per cent)	Prunes (per cent)	Walnuts (per cent)
Alameda	*	*	14	9	#	#	#	#	*	2	*	*	#
Butte	12	*	#	*	3	#	14	*	3	2	*	2	#
Colusa	4	#	*	#	#	#	#	#	*	*	#	*	#
Contra Costa	11	*	*	*	#	#	#	#	*	6	*	*	#
El Dorado	#	*	#	*	#	#	#	#	*	3	*	*	#
Fresno	#	#	5	#	53	*	3	*	29	#	#	*	#
Glenn	*	*	*	#	#	*	*	*	*	#	#	*	#
Humboldt	#	2	#	*	#	#	#	#	*	*	#	*	#
Imperial	#	#	*	#	*	#	#	#	#	#	#	#	#
Inyo	#	*	#	#	#	#	#	#	*	#	#	#	#
Kern	#	*	*	#	#	#	#	*	*	*	*	*	#
Kings	#	#	5	#	#	#	#	#	6	#	#	*	#
Lake	*	*	#	#	#	#	#	#	*	8	#	*	#
Los Angeles	2	2	4	#	*	31	14	26	4	*	3	#	30
Madera	*	*	*	#	3	#	2	#	*	#	#	*	#
Marin	#	*	*	#	#	#	#	#	*	*	*	*	#
Mendocino	#	*	#	#	#	#	#	#	#	*	#	*	#
Merced	*	#	*	#	9	#	*	#	3	#	#	#	#
Modoc	#	*	#	#	#	#	#	#	#	#	#	#	#
Monterey	*	12	2	*	#	#	#	#	*	*	*	*	#
Napa	*	*	*	*	#	#	*	#	*	4	*	4	#
Nevada	#	3	*	*	#	#	#	#	*	*	*	#	#
Orange	#	*	4	#	#	7	#	10	*	#	#	#	38
Placer	*	*	#	3	*	#	*	*	6	7	39	#	#
Riverside	3	*	7	*	#	16	11	14	*	*	#	*	#
Sacramento	6	*	*	5	#	*	5	*	*	18	8	*	#
San Benito	*	#	6	*	#	#	#	#	*	*	#	3	#
San Bernardino	#	4	4	*	#	13	7	31	5	#	#	#	2
San Diego	#	*	*	#	#	10	5	*	*	*	#	#	*
San Joaquin	12	#	3	25	#	#	4	#	8	4	*	*	*
San Luis Obispo	*	*	*	#	#	#	#	#	*	*	#	*	#
Santa Barbara	#	*	*	2	#	*	2	*	#	#	#	#	10
Santa Clara	#	*	21	26	#	#	#	#	5	9	18	55	#
Santa Cruz	#	51	3	2	#	#	#	#	*	*	*	*	#
Shasta	*	*	#	#	#	#	*	#	*	*	#	*	#
Siskiyou	#	*	#	*	#	#	#	#	*	*	*	#	#
Solano	6	#	3	10	#	#	#	#	3	6	16	4	#
Sonoma	#	16	*	9	*	#	5	#	*	6	*	12	*
Stanislaus	6	#	*	*	5	#	#	*	3	*	#	#	#
Sutter	9	*	*	*	3	#	*	#	2	*	*	*	#
Tehama	*	*	*	#	*	#	11	*	*	2	*	*	#
Tulare	#	#	*	#	6	5	6	13	9	#	2	4	#
Ventura	#	#	6	#	#	15	#	2	#	#	#	#	20
Yolo	11	#	5	#	5	#	3	#	2	9	4	2	#
Yuba	*	*	#	#	2	#	3	*	*	*	*	#	#

*Less than 2 per cent of state's normal crop grown in county.
#Not grown commercially.

QUARANTINE DIVISION.

REPORT FOR THE MONTH OF JULY, 1917.

By Frederick Maskew.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	81
Passengers arriving from fruit fly ports	4,212

Horticultural imports:

	Parcels
Passed as free from pests	127,888
Fumigated	3,063
Refused admittance	107
Contraband destroyed	33
Total parcels horticultural imports for the month	131,091

Pests Intercepted.

From Central America:

Aspidiotus cyanophylli, *Chrysomphalus scutiformis* and *Pseudococcus* sp. on bananas.

From China:

Larvæ of weevil in sweet potatoes.
Lepidopterous larvæ in dried herbs.
Weevil and lepidopterous larvæ in dried potatoes.
Weevil in roots.

From Hawaii:

Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Coccus longulus on betel leaves.
Larvæ of Trypetid in mangoes and string beans.
Weevil in seed pods.

From Japan:

Coccid on pot plant.

From Mexico:

Larvæ of weevil in beans.

From New York:

Diaspis boisduvalii on orchids.

From South Sea Islands:

Pseudococcus sp. on palms.

From Tahiti:

Coccid on oranges.

LOS ANGELES STATION.

Steamship and baggage inspection:

Ships inspected	33

Horticultural imports:

	Parcels
Passed as free from pests	134,291
Fumigated	353
Refused admittance	6
Contraband destroyed	12
Total parcels horticultural imports for the month	134,662

Pests Intercepted.

From Central America:

Aspidiotus cydoniæ and *Aspidiotus cyanophylli* on bananas.

From Connecticut:

Pseudococcus sp. on ornamental plants.

From Mexico:

Calandra sp. in corn.
Unidentified lepidopterous larvæ in dried bananas.

From New Jersey:

Hemichionaspis aspidistræ on sago palm.
Diaspis boisduvalii on orchids.
Gymnaspis æchmeæ on *Vriesia speciosa.*
Aspidiotus cyanophylli on *Anasas sativus.*
Pseudococcus sp. on *Medinilla magnifica* and dracenas.
Eucalymnatus tessellatus on palm.

From New York:

Saissetia oleæ on Cycads.

From Pennsylvania:

Saissetia hemisphærica on gardenias.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	15
Fish boats inspected	18
Passengers arriving from fruit fly ports	86

Horticultural imports:

	Parcels
Passed as free from pests	2,519
Fumigated	0
Refused admittance	0
Contraband destroyed	4
Total parcels horticultural imports for the month	2,523

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	8

Horticultural imports:

	Parcels
Passed as free from pests	2

SANTA BARBARA STATION.

(No report.)

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GOLDEN ANNIVERSARY

FIFTIETH

CALIFORNIA FRUIT GROWERS' CONVENTION

SACRAMENTO

November 21, 22, 23, 1917

under the auspices of
the

COMMISSION OF HORTICULTURE
STATE OF CALIFORNIA

VOLUME VI Nos. 11 and 12

MONTHLY BULLETIN

The County Horticultural Commissioners in Assembly at Modesto, California, June, 1917.

OF THE

STATE COMMISSION OF HORTICULTURE

SACRAMENTO, CALIFORNIA NOVEMBER-DECEMBER, 1917

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THE MONTHLY BULLETIN

CALIFORNIA STATE COMMISSION OF HORTICULTURE.

DEVOTED TO HORTICULTURE IN ITS BROADEST SENSE, WITH SPECIAL REFERENCE TO PLANT DISEASES, INSECT PESTS, AND THEIR CONTROL.

Sent free to all citizens of the State of California. Offered in exchange for bulletins of the Federal Government and experiment stations, entomological and mycological journals, agricultural and horticultural papers, botanical and other publications of a similar nature.

G. H. HECKE, State Commissioner of Horticulture----------Censor
GEO. P. WELDON, Chief Deputy Commissioner----------Editor

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VARIED DUTIES OF COUNTY HORTICULTURAL COMMISSIONERS.

The purpose in publishing a special number of the Monthly Bulletin devoted to articles from the county horticultural commissioners is to impress upon the readers of the Bulletin the varied field of action represented by the problems of the 48 counties, each employing a horticultural commissioner.

We appreciate the fact that every county horticultural commissioner in the state responded to the request for an article for this special issue. The material contained in these articles is as varied as the interests of the counties represented.

The work of pest control, being in line with the chief duties of the horticultural commissioners, has a prominent place in these articles. An intimate knowledge of this work must be possessed by every one of these officials; and in addition it will be seen that their field of action in protecting the fruit interests of the state is so broad that other lines of activity of necessity have been touched upon. Thus we find embodied in these articles a knowledge of soils, irrigation, pruning, crop acreage, crop production; in fact, the necessary field work has been such as to keep these men in close contact with every problem of the orchard and field. As a consequence their services have for many years been in demand, not only as horticultural police officials, but also as horticultural advisers. It will be well to remember that much of the horticultural expansion of our state is due to the fact that the pioneers in the California fruit industry realized many years ago, before the advent of the present farm adviser movement, the great value of advisory work.

The farm adviser movement in California has now limited the advisory functions of the county horticultural commissioners; on the other hand the commissioners' police duties have been greatly increased, so that in addition to the enforcement of quarantine laws and orders, dealing with the prevention and eradication of insects and plant diseases, he is charged with the eradication and control of rodents and weeds, as well as with the enforcement of the fruit standardization laws. G. H. H.

STATE QUARANTINE GUARDIANS.

From a digest of the horticultural statutes of this state it would appear that the duties of the county commissioners of horticulture are so multifarious and complex that the full and complete execution of the same would leave but little time for other functions, yet it is true that, in addition to the work prescribed for them in the provisions of their own empowering act and the direction and supervision of the packing of fresh fruits to meet the requirements of the standardization act, they do find time to perform other duties which, while but little recognized outside the rank and file of the service, are of vital importance to the continued health and cleanliness of our orchards and farms. Commissioned as state quarantine guardians they are thus authorized to carry out all the provisions of the state quarantine law and the regulations of the several state quarantine orders. This service, while gratuitous upon their part, is capably and zealously performed, and constitutes a complete system of control over the imports of plant products at all points of delivery in the state. Were it not for this systematic interception and examination of imports arriving by rail and mail at interior points, the efforts of the quarintine inspectors to keep out insect pests and plant diseases at the maritime ports of entry would soon be brought to naught. This fact is patent to the executive head of the quarantine division at all times. The real value of this cooperative work in the sum total is properly appreciated and, with a full recognition of the strength and sanity of the statutes that give legal sanction and authority to carry on this work, we know with a clarity and understanding born of long experience that the prime factor of success in the endeavor is and always will be the one of personal equation. As a formula for continued success we sum up in the language of Kipling: It ain't the law nor ordinance, nor fines that we can lay, but the close cooperation that makes us win the day. It ain't the individual nor the service as a whole, but the everlasting teamwork of every blooming soul.

F. M.

THE COUNTY COMMISSIONERS AND THE INSECTARY.

The county commissioners of horticulture have always manifested a lively interest in the work of controlling insect pests by the use of their natural enemies. Being in direct contact with the growers and appreciating perhaps as no one else can the difficulties with which they have to contend, greater economy in insect control is to them a much desired condition. In the carrying out of their routine duties in connection with clean-up work the county commissioners frequently find it necessary for the good of a community to compel the treatment of an orchard for pests when the grower is financially unable to undertake such a burden. It is then that the great desirability of control so far as possible by natural enemies is brought home to them.

County commissioners, through the fact that they are continually patrolling the entire state for insect infestations, have been of the greatest service to the insectary. With our limited staff of entomologists it would be impossible to keep in touch with orchard conditions throughout the state if we did not have this help. It is sometimes necessary to find on short notice a suitable place for colonizing new parasites, and for this purpose we can make use of information which the commissioners are able to supply. They are also frequently of great assistance in procuring for us quantities of host material on which we can breed our natural enemies. In the handling of the common ladybird, *Hippodamia convergens*, they have undertaken a large part of the field work and in this way have enabled us to make a more just distribution of these predators. Requests which come to us for colonies of beneficial insects to be sent out of the state are also often complied with through the knowledge which the commissioners gain by their continued presence in the orchards.

In return for all this active assistance on the part of the commissioners we hope the insectary has been of some service to them in the identification of material and in helping them to aid the growers in their insect problems. H. S. S.

THE SOUTHERN BRANCH INSECTARY.

The work of our southern branch of the insectary at Alhambra is now well under way and gives promise of results of much value to the growers of subtropical fruits. Our present efforts are almost entirely confined to the various mealybug and closely-related problems, although later we will study other citrus and subtropical fruit insects. The most important project has to do with the citrophilus mealybug, now occurring in several places in the orange belt and causing great damage to the industry. We are expecting to help solve the problem through cooperative work with the Citrus Experiment Station and the United States Department of Agriculture. It has been shown that the common citrus mealybug may be largely controlled by its natural enemies, providing the Argentine ants are kept from the trees. We will endeavor to give a practical demonstration of this in several places by destroying the ants and adding quantities of parasites and predators from elsewhere.

Our program at the branch insectary includes studies and experiments in Argentine ant control, working with bands, poisons and trap nests. This ant must be checked in order that the natural enemies may become effective.

The distribution and following up of the Sicilian mealybug parasite is an important part of the work. We hope to colonize this valuable parasite in large numbers during the next season. A colony of over 25,000 was put out in Ventura County during September. We are working with several newly-introduced ladybirds as well as with *Cryptolæmus* and some native predators such as the brown lacewing and the *Leucopis*.

Besides the practical work enumerated above, considerable research work must be done on the habits of the various natural enemies of which we hope to make use. We also expect to find out exactly what mortality occurs in the parasites and predators when the orchards are fumigated.

During the past summer thousands of beneficial insects have been distributed in the citrus groves from the insectary, and next year, as we become better equipped, it is expected that our colonization will increase to many times the present extent.

G. H. H.

FLORIDA PLANT BOARD EXTENDS COURTESIES.

Mr. A. S. Hoyt, as the representative of the California State Commission of Horticulture, was accorded a most cordial reception by Florida Plant Commissioner Wilmon Newell and his staff, during a recent trip to study citrus canker in the Gulf States.

Mr. Newell placed at Mr. Hoyt's disposal the records on file in the plant commissioner's office, thus giving him access to information that will prove of great value to the citrus interests of the state. Liberal arrangements were made for manning inspection trips through the citrus groves of Florida, where district inspectors gave our representative most favorable opportunities to make his own observations on citrus canker.

We are under lasting obligations to Mr. Newell and the State Plant Board of Florida, and we take great pleasure in acknowledging and recording, in the pages of our Monthly Bulletin, our appreciation of the many courtesies extended.

G. H. H.

THE GULF STATES AND CITRUS CANKER.

The citrus fruit growers of the Gulf States have been brought face to face with a serious situation in the fight with citrus canker which was introduced into these states a few years ago. The State Commission of Horticulture, realizing the importance of this new disease, desired to secure adequate information concerning it, by means of which to improve our quarantine and to facilitate the prompt action needed for its eradication should it be introduced into California. To obtain this information Field Deputy A. S. Hoyt was sent to Florida to investigate and to study in the field the work of eradication of this disease.

From the report of this investigation it is evident that the serious nature of citrus canker can not easily be exaggerated. The greatest credit is due the fruit growers of Florida, the pioneers in the work of its eradication, for their courage in undertaking such a task—without a parallel in horticultural history—and for the consistent support which they have since given this movement. The campaign to wipe out citrus canker in Florida is carried on by the United States Department of Agriculture in cooperation with the Florida State Plant Board under the personal direction of Florida Plant Commissioner Mr. Wilmon Newell, and has made such remarkable progress as to justify the most encouraging predictions as to its final outcome. Efficiency, energy and enthusiasm for the work is the combination needed to win, and that combination exists today in Florida.

Nothing could be further from our mind than the desire to profit from the misfortune to our sister state, but the fullest consideration to this principle does not preclude us from availing ourselves of the valuable lesson which may be learned from the costly experience with citrus canker in Florida, and this lesson stated briefly is that adequate quarantine, and inspection of groves, nurseries and nursery shipments is necessary if we are to prevent the introduction and spread of diseases and insects likely to cause a decrease in crop production in California. G. H. H.

THE MONTHLY BULLETIN.

CALIFORNIA STATE COMMISSION OF HORTICULTURE

FRUIT INSPECTION IN OAKLAND MARKETS.

By Fred Seulberger, County Horticultural Commissioner, Oakland, Cal.

Since the Apple Standardization Law and the Fresh Fruit Standardization Law became effective on July 27, 1917, we have been enforcing them by inspecting all shipments coming to Alameda County markets. It is a significant fact that since making these inspections there has been a marked improvement in the standard of the fruit shipped to our markets. The first month of inspection proved hard on account of fruits coming from unsprayed or poorly-sprayed orchards, where the owners discovered that they had a very small portion of good fruit to send to the market. As a result they mixed the wormy, diseased, windfalls, bruised and otherwise low-grade rubbish in the boxes, and then topped it off with fairly good fruit. This fruit was promptly condemned, some being returned to the shipper and some sent to the driers and the rest fed to hogs. Any fruit that does not comply with the standardization laws will not be allowed to be sold in the Alameda County markets.

Apples, pears, peaches and all kinds of fruits are not worth a dollar while merely hanging on the trees. Their only value lies in the ability to change them into money, and this change comes from the consumer. Then the thought and care therefore ought to be to please him from the time these fruits are in blossom until they are packed, and especially while being packed the consumer should be borne in mind. Instead of doing this, however, the sole thought of some has been to unload just as much "junk" as possible and take the chance of being able to dispose of it.

The Apple Standardization and Fresh Fruit Standardization laws require the cooperation of the farmer, the commission man, the retailer and the consumer, to aid in the elimination of the shiftless grower from marketing his culls. The honest pack and a square deal with it tell the world that our products are right. Standardization proclaims, if honestly enforced, that there are no worms, diseased, bruised, windfall or cull fruit in the middle of the package. By standardizing our fruit pack and establishing markets for high-grade fruits contained therein, we increase consumption, stabilize prices, decrease the risk and cost of handling and form a proper basis for advertising.

The retailers and commission men have been handling fruit in the dark. On Monday the fruit may prove to be good, on Tuesday fair and all the rest of the week very poor. The waste in many instances from low-grade fruit in the center of boxes and also from diseased fruit is great. The retailer, therefore, is forced to put his selling price high as a protection against such undesirable stock. With this uncertainty eliminated and a standard pack assured he can afford to handle it on a smll margin because he knows that he can depend upon the reliability of the commodity. In the standard grade we should have something definite and capable of identification so that none will be misled. It should be a specific brand so that when a box of fruit is purchased with that brand upon it the quality is guaranteed.

CHESTNUTS IN BUTTE COUNTY.

By Earle Mills, County Horticultural Commissioner, Oroville, Cal.

Owing to the destruction throughout the Eastern states by the chestnut bark disease, of both commercial plantings and forests of chestnut trees, the available supply of this nut is materially lessened each year. Nor is it anticipated that this disease will soon be brought under control in those sections already infected.

This industry so long neglected in our state bids fair to come into its own, largely because this disease has curtailed the output of the Eastern sections, formerly producing the bulk of the crop, and because of the rigid quarantine measures in force causing the planters to feel more assured that the new plantings of chestnuts will continue to be thrifty.

The predominating red clay soils characteristic of the foothills of the eastern portion of Butte county are exceptionally well adapted to the production of large thrifty trees, which produce quantities of superior chestnuts, as is attested by the numerous small plantings scattered over this area. These red clay soils of our foothills are pre-eminently adapted to chestnut culture, but by no means is it the only type of soil upon which chestnuts will thrive, as these trees may often be seen growing upon soil that is unsuited for most other kinds of commercial trees; even very stony ground will grow good chestnut trees. So aside from its desirability as an orchard tree it can be strongly commended for steep hillsides and in pastures, or other places where beauty as well as profit may be desired.

The varieties chiefly grown in Butte County are the so-called "Spanish," "French" and "Italian," the latter variety largely predominating. Occasional trees of the "Japanese" type are met with; this variety, however, is not in great favor, chiefly on account of the nut being less sweet and of inferior quality to the others; in fact, its only points of merit are the large size of nut, and the trees' dwarf habit of growth. The native American chestnut is only represented by a few trees in this locality, for although the nut is quite sweet it is rather small, and the tardiness of the tree to come into bearing it also in disfavor.

As with the date, and a few other fruits, so also with the chestnut, the male and female blossoms are born upon separate trees. The burs containing the chestnuts are from the female trees. There may be a few burs from female trees which contain occasional nuts, when no male tree is within miles of the producing tree, but no one familiar with the industry would think of planting out any acreage without including a few male trees.

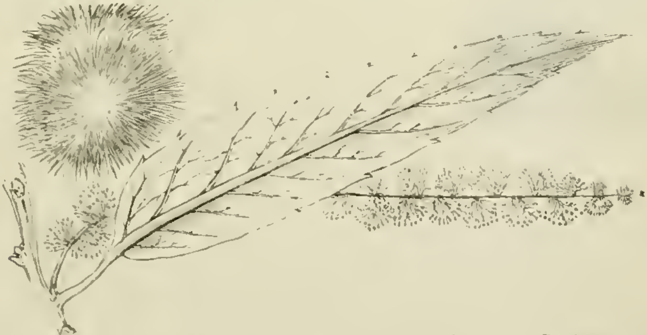

Fig. 134. Leaf, flower and fruit of the Spanish chestnut, *Castanea sativa.* (State Comm. of Hort.)

A few of the older plantings were made as close as twenty feet apart, but considering the fact that, when these trees become twenty years of age they will each have an immense spread, and if they have been planted so close they will lose all lateral branches, it must be deemed a serious mistake to crowd them so close. In no case should the standard types be planted closer than thirty feet apart, and thirty-five or even forty feet apart is desirable. The dwarf sorts may, of course, be planted closer to advantage.

The cultural methods in commercial chestnut growing are very similar to those required for other trees and come within the general rule, that the better care given assures a larger growth of tree and a greater productiveness. In choosing trees for the commercial orchard preference should be given to budded trees, and if from those of known parentage it will be of advantage. New plantings are sometimes made with seedling trees, but these do not always come true to the desired type, and to that extent are not so desirable.

It is always of interest to prospective planters to learn the financial side of the situation confronting them when they take up the matter of setting out a new acreage. It therefore is a pleasure to state that in favorable localities in this county chestnut trees as obtained from nurseries come into bearing at three years of age, and of course bear increasingly heavy crops for fifty years or more. From a small tract on property of Dr. Mack at Paradise, Butte County, he has been harvesting large crops annually which, after proper deductions being made for the lesser net profit from a large planting, than that of a small area, would assure an income, clear of all expenses, at the rate of over $200 per acre. It may be said that this is not an exceptional yield but only the average of most well-kept tracts.

THE FUTURE OF THE ALMOND IN COLUSA COUNTY.

By L. R. Boedefeld, County Horticultural Commissioner, Colusa, Cal.

The future of the almond in Colusa County is assured. There are at this time something over 5,000 acres of trees, all of which, with the exception of a very small per cent, are located in the southwestern part of the county and on land at the base of the western foothills. In the center of this district are the towns of College City and Arbuckle. Almonds have been produced in the Arbuckle section of the county since the early eighties, but only on a small scale and little attention was paid to them even by the owners of the producing orchards, because, with the exception of a few vineyards, that country was entirely devoted to the raising of grain and stock, and it was impossible to get any of the big farmers to grow orchards. The real planting of the almond began in the district about eight years ago, when two large ranches were sold and put on the market in small tracts. The success of the subdivision of this land, and its planting to almonds, is due more to the efforts of D. S. Nelson than any other one man in the county.

The land on which the plantings were made was in most cases considered poor grain land by the farmers of that section, and as a matter of fact a large portion of the land was not fit for grain and was used for range purposes. But it was the nature of the soil and the climatic conditions which made it the favored spot for the almond. It is the wonderful ability of the soil to retain the moisture that made the plantings a success, and it is the almost entire freedom from frost during the flowering season that has made the bearing trees the large producers that they are. It is never necessary to irrigate the almond tree in that section after it has reached the bearing age, if the proper cultural methods are used, and the only water used on the young trees was during two dry seasons when the rainfall was far below the average.

The freedom from frost in the spring is due to the fact that the orchards are on land which has perfect air drainage: land in which there are pockets for the cold air to settle in are avoided for almond planting.

The almond begins to bear a paying crop in its fourth or fifth year. It is not uncommon for a five-year orchard to produce $200 worth of almonds per acre. As there are now several hundred acres, seven years or older, the almond can be considered as an established industry in this county, and if the plantings continue on the same scale for the next eight years as they have for the past eight, and there is every indication that they will, because there are still thousands of acres of ideal almond land available at a reasonable price, the almond will produce more wealth for the county than all the other horticultural interests put together.

DWARF PEARS.

By FRANK T. SWETT, County Horticultural Commissioner, Martinez, Cal.

Twelve years ago, at the Hillgirt orchards, we were faced with a definite problem. We had planted standard pear trees alongside an old orchard, which, like most old orchards in this part of the state, was infested with *Eriosoma pyricola*, a root louse smiliar, but not identical, with the woolly apple aphis. This pest, about which very little is known, has infested pear orchards in California for over thirty years.

A large proportion of the young trees were stunted by the attacks of the aphis. Some trees died; others just lingered along. A few trees grew nicely in spite of the aphis. This may be accounted for by the fact that the roots of all seedling trees vary in their characteristics. French pear seedlings come from seeds taken from the pomace piles of pear cider and pear vinegar factories in France. They are not the seeds of Bartlett and our well-known *Pyrus communis* species, but are the seeds of the wild pears of France, *Pyrus nivalis*, according to Waugh. There is a wide variation among them. Look down a nursery row of French seedlings, and you will find broad leaves, narrow leaves, smooth leaves, rough leaves—all sorts of variations. The roots, of course, also vary.

So, despairing of obtaining a healthy uniform orchard on French root, we planted dwarf pears. We are glad we did.

The trees were obtained from a nursery in Alameda County which makes a specialty of dwarf pears. Angers quince roots, grown from cuttings, are planted, and these, of course, are uniform. As the Bartlett does not make a good union with quince, the Beurre Hardy is budded on the quince root. The next season the Bartlett is budded on the Beurre Hardy, so we have a three-story pear tree, root, quince; stem to a height of 12 inches, Beurre Hardy; top, Bartlett. They are called "double worked" pears.

Instead of waiting ten years for a crop, we had a commercial crop of a box to the tree, or 170 boxes to the acre at the sixth year. Since then, we have had five good crops of pears. Standard trees alongside are only just beginning to bear commercial crops. We have, therefore, had an income for five years which would not have come to us on this land with standard trees.

This season we picked 1,200 boxes of fine, clean, shapely pears from three acres of dwarfs. They have netted us a little over two dollars a box, f. o. b. cars at shipping point here.

Our trees are planted 16 feet apart. I think 14 feet apart would be a little better, giving 221 trees to the acre instead of 170.

The trees are stocky and strong. They are from 6 to 8 inches in diameter a foot above the ground. They are about 10 to 12 feet high, and are broad and spreading.

There are some cultural advantages of the dwarf trees. Our men prune about 60 of these trees a day as against 16 to 20 standard trees. Spraying can be more thoroughly done, as the trees are close to the ground. No tower is required on the spray rig. It is easier to reach every part of the tree, and the result is almost absolutely clean fruit. It is not easy to spray large trees 16 to 20 feet high and shoot the spray into every bud cluster so as to effectively control pear thrips.

When it comes to picking, there is material economy. Most of the pears are picked without the use of a ladder, and only a short ladder is required to gather the pears higher up. I have seen a good picker picking at the rate of 60 boxes a day on these dwarfs, where the average rate on standard trees was 20 boxes a day, owing to the time expended in climbing up and down ladders and moving the ladders.

There are pros and cons in all enterprises. As against a perfectly healthy standard orchard 20 years old and a similar dwarf orchard of the same age, the standard orchard should give more fruit. But comparing an irregular standard orchard affected with root aphis, and a dwarf orchard, the dwarfs might be preferable.

The quince root is not as resistant to oak fungus as the French root, and where this fungus is a menace, dwarfs should not be planted. Dwarf trees suffer just as severely from blight as standard trees.

If carelessly pruned, dwarfs may overbear while still young and become stunted. They require good soil, and a fair amount of moisture. Our orchard has never been irrigated, and has never suffered from drought, with an average rainfall of 21 inches, and has passed through two seasons of drought, with less than 12 inches of rain each season for two consecutive seasons. During these dry years a few standard trees on the same kind of soil, trees injured more than their standard neighbors by aphis, almost died, so that they had to be headed back to the forks of the trees.

There are a number of commercial plantings of dwarfs in Contra Costa County, and there will be more, particularly on the soils where aphis is a problem. Some trees of Japan root—standards—are being planted. Apparently the Japan root has somewhat greater resistance to the aphis than the French root, besides being quite resistant to blight. It is not immune, however, and it will take a number of years to find out its adaptations and uses.

Where standards on Japan root are planted, 24 by 24, dwarfs can be advantageously used as fillers, with the idea of cutting them out at the age of about fifteen years.

Certain nurseries have sold Bartletts worked direct on quince root. The union is defective, and trees are apt at any time to break at the union. Such trees should never be planted.

Examination of our trees shows they are true dwarfs—that is, the Hardy has not thrown down roots. Had they been planted with the unions underground, this might have happened, and whether it would have been a detriment or a benefit I can not say.

Young dwarf trees should always have tree protectors the first season, as they sunburn very readily. After the first season there is no danger of sunburn.

FRUIT GROWING IN EL DORADO COUNTY.

By J. E. Hassler, County Horticultural Commissioner, Placerville, Cal.

El Dorado County is the empire county of the state. Here gold was first discovered in January, 1848. Its area, according to the California State Board of Agriculture, is 1,753 square miles, or 1,121,920 acres. Along the western border stretches a belt of land peculiarly adapted to the growth of fruits such as the olive, the fig, the apricot, and in some favored spots the orange and lemon. From here by gradual ascent we reach the higher altitudes which produce our fancy mountain fruits. The red soil here is usually covered by a heavy growth of scrub oak, manzanita, buckeye and chaparral; here is where the fruit of the vine reaches perfection. As we go still higher and reach the upper foothill region at an altitude of from 1,500 to 2,500 feet, we find the soil covered with heavy growths of timber, such as the black oak, live oak, pine, spruce, cedar, etc., while the banks of the streams and creeks are lined with alder, dogwood, madrone, etc. At this altitude and up to 3,000 feet are grown all our deciduous fruits for Eastern shipment. Here also the cereals produce good remunerative crops, while potatoes and all garden vegetables attain perfection both in size and quality. The pear, plum, peach, grape, apple and all orchard products of a temperate zone attain excellent size, color, flavor and keeping quality.

Here we find varieties of apples and pears planted out by the pioneer miners in early days, which are practically growing wild around where their cabins stood, but which long since have disappeared. The fruit trees are still thriving in many cases completely surrounded and hemmed in by native brush. I wish to call attention to one remarkable circumstance. Seven years ago, when I was first appointed county horticultural commissioner, I made a personal inspection of all orchards in the county, and in my travels I found many of these abandoned locations with apple and pear trees growing thriftily, but these as well as cared-for orchards were all badly infested with San Jose scale. These trees have never been sprayed and yet today are all free from scale and bear good clean fruit.

Bartlett pears are leading in acreage, with shipping plums next. The Bartlett is the favorite and most remunerative of all fruits grown in this county. Apples grown at altitudes of from 2,000 to 3,500 feet are simply grand both in flavor and keeping qualities.

MOVING PICTURES IN HORTICULTURAL WORK.

By Fred P. Roullard, County Horticultural Commissioner, Fresno, Cal.

It is impossible to predict what the motion picture will achieve in value to the horticulturist in the near future.

While performing the duties of county horticultural commissioner one often comes in contact with situations, which, if applied to the screen, would be of a tremendous educational value for growers or students of horticulture. The horticultural field into which the movie man may enter is large and its possibilities are shown by the sample pictures given in this article. Not only life histories of insects, but the methods of their control can be demonstrated. Methods of cultivation, pruning, general care of orchards and vineyards also can be illustrated by experts in comprehensive animated pictures. Such pictures bring lasting impressions and serve a distinct educational purpose.

Anyone who has tried photography of minute insects, or microphotography, can realize the difficulties that a camera man encounters in photographing an object, to picture it at its best advantage, in which light, magnification, contrast with accompanying objects or scenic background and depth of picture and foreground must be duly considered. These difficulties are by no means solved when it comes to taking a moving picture. The cost of doing this kind of work is high. Not only the apparatus but the material is expensive, so it hardly justifies anyone but an experienced person to take pictures of this kind.

Claude C. Laval of Fresno came into my office over a year and a half ago, stating to me that he was interested in the taking of motion pictures of beneficial and injurious insects of California, with the idea of making the films as complete as possible and with descriptions of the subjects treated. Realizing the great advantage that this kind of work offered, I gladly offered my assistance and helped with others to direct his efforts, as Mr. Laval is neither entomologist nor horticulturist. As a result I am able to say that the work has been more than gratifying. Films have been obtained far beyond sanguine expectations. Some of these films have been shown in our local theaters before audiences of invited horticulturists and all have expressed a delight in the method of treating the subject and its impressive comprehensiveness.

Not only is the art of taking motion pictures of insects interesting from a photographer's point of view, but the study of their life histories can be brought out in more detail and many unfamiliar and very interesting points of an insect's life may be exemplified. For instance, the time of day when the molting of the grape leaf hopper most frequently occurs is early in the morning between six and seven o'clock. This fact was very forcibly brought to the notice of the photographer and was of interest to the entomologist because after that time it was difficult to find a hopper molting.

No doubt the motion picture will eventually become a highly important factor in treating horticultural and entomological subjects as its possibilities are being recognized more and more by those connected with the work.

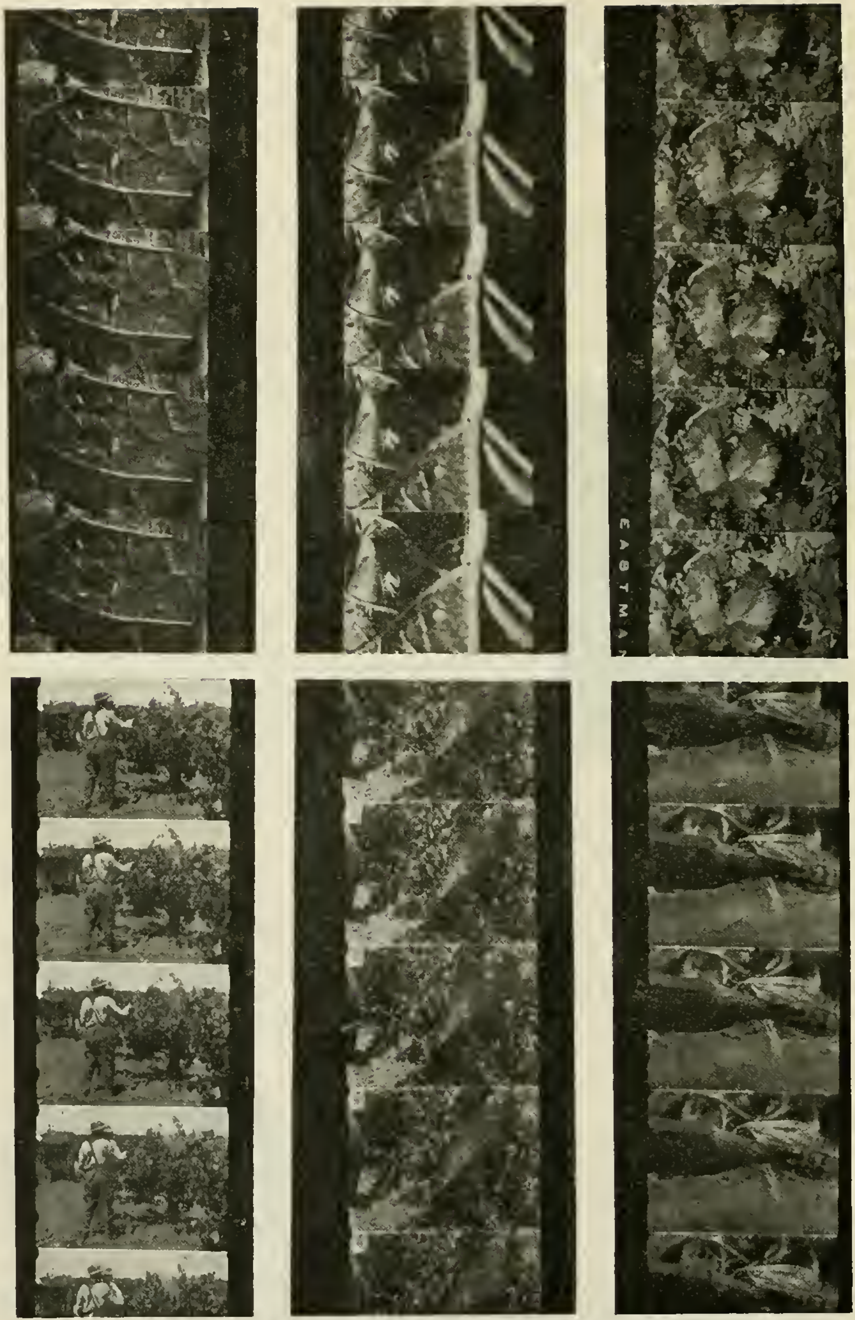

FIG. 135. Sections of moving picture films showing vineyard spraying and studies in insect life. (Photo by Claude C. Laval.)

FRUIT GROWING POSSIBILITIES OF GLENN COUNTY.

By C. Hugh Wren, County Horticultural Commissioner, Orland, Cal.

Glenn County's position among the fruit producing counties of the state is all in the future, but that future is particularly bright. Only a few short years ago all that greeted the traveler's eye was billowing fields of grain or large areas devoted to grazing from one end of the county to the other. Enough fruit of different varieties had been planted, however, to prove conclusively that our soil and climatic conditions were favorable and it only remained to develop irrigation facilities on a large scale and to cut up the large holdings to allow the orchardist to come in and do his part.

Two large irrigation canals, the government storage dam and canal system at Orland, and the Central Canal, taking water out of the Sacramento River near Hamilton, now furnish water to a large part of the county, while there are large areas of land that can be irrigated by means of pumps tapping the inexhaustible underground supply.

That advantage is being taken of these conditions we have abundant evidence when we find that now we have about 2,500 acres of bearing and about 7,500 acres of nonbearing trees of various kinds.

While we have conditions as favorable for citrus and olive culture as anywhere in the state, it will be as a producer of almonds, prunes and figs that the future rank of Glenn County will be reckoned.

We now have about 600 acres bearing almonds and 1,250 nonbearing. The quality of nuts produced is equal to the best anywhere. The opportunity for the growth of this industry is indicated by the fact that we have not had a total failure in the twenty-three years our oldest orchard has been planted and that in that time only once have orchard heaters been used. A fair average production from our soil is three-fourths of a ton per acre. There are at least thirty thousand acres in the county that is the very best type of soil for the growing of this nut and all of it capable of being irrigated.

The prune is coming unto its own here likewise. While we have only about 200 acres bearing, about 1,600 acres additional are now growing and fully twenty thousand acres lying along our river and creek bottoms are available for the culture of this staple food crop. Even the sedimentary clay loams along our numerous winter watercourses across the floor of the valley are highly satisfactory for prune culture. One 30-acre five-year-old orchard on one of our poorer soil types will yield a crop this year of about 6½ tons of dried prunes.

Our prunes are high in sugar content and run uniformly to the larger sizes. Under average climatic conditions they dry evenly with small per cent of bloaters. Our weather conditions are perfect for sun drying as is the case elsewhere in the Sacramento Valley.

Figs are being planted to the extent of about 50 acres bearing and 350 coming on later. Old trees here have long produced exceptionally heavy crops of fine quality and the young trees now producing are proving as profitable here as anywhere in the state. The area suitable for figs is large and the planting will undoubtedly be largely augmented from year to year.

While the three kinds of trees indicated above are, in my judgment, the ones that are going to be the leaders in this county, I can not pass without mentioning that much of our land is suitable for peaches, both canning and drying, as well as for shipping plums.

APPLE GROWING AND TRANSPORTATION.

By J. F. Benton, County Horticultural Commissioner, Eureka, Cal.

The small apple grower, the man with five to 50 acres of orchard, the man with whom the majority of the county horticultural commissioners come in contact, is rapidly learning from experience the value of well-grown, well-graded fruit, packed in an attractive manner. Compensation received for a fancy article always justifies the labor and expense of careful production and transportation.

The man who has availed himself of the ample opportunities presented in the past few years, by the educational activities in operation in this state, is now entering into an era of profit and satisfaction; a profit well earned and the satisfaction of honest labor well performed.

He who has allowed himself to be governed by slipshod methods, who has been satisfied to dream away the hours in anticipation of the golden harvest, and who has been unwilling to heed "the handwriting on the wall," suddenly finds himself rudely awakened. The fact that his golden harvest has resulted in a "mess of pottage" undesirable to the consumer, a thing condemned as a public nuisance, unfit for sale or transportation, confronts him.

The production of commercial apples, for sale and transportation, results from a series of well-defined operations executed in an intelligent manner, the main factors entering into the business being pruning, spraying, cultivating, thinning, picking, grading, packing and transportation. The neglect to give careful attention to any one of these points may result in a material reduction in the compensation received for the finished crop.

Systematic, annual pruning of producing apple trees, carried on intelligently, should result in: Sufficient thinning out to admit air and sunlight; heading back to bring tree within easy reach of spraying or pruning operations; cutting back long willowy growth to stiffen main laterals, thus forcing fruit spurs onto strong carrying wood.

The well-pruned tree is approached by the man with the spray outfit with confidence. He knows he will be able to reach each portion with the utmost economy of power and material. His knowledge of the results to be obtained is essential. He sprays, to protect the tree and branches from fungous attacks; to kill insect eggs and reduce scale insects; to protect buds and blossoms from insects and fungi; to preserve the foliage; to protect fruit from fungi and insects. With these objects in view the successful apple grower performs his task.

Failure to cultivate promptly, thus allowing the soil to become hard, cracked, open or weedy, results in loss of moisture and may materially reduce production. Cultivation is for the purpose of conserving moisture, destroying weeds, and aerating and warming the soil. The proper soil condition maintained by thorough cultivation is a factor often overlooked in apple growing.

Thinning overproducing trees pays well. The results to be obtained may be enumerated thus: first, thinning maintains tree vigor; second, induces annual crops instead of alternate; third, produces fruit of maximum size, color and quality. Observation has proven conclusively that overproduction results in poorly-developed crops, the greater portion unsalable. On the other hand, the overproducing tree thinned to its carrying capacity produces as many boxes of salable size fruit as the unthinned tree produces of unsalable and salable together. I make money each year by thinning my trees and to those who have not practiced this economy I would suggest giving this important factor a trial.

Generally there should be more than one picking. The first time select only matured fruit, allowing balance to grow into money. The time to pick should be governed by variety. The experienced man can judge by the condition of the tree. The brown seed denotes maturity, which is also determined by color in some varieties, while size governs the picking time of others. Pickers should be furnished with strong, light ladders to conform to the size of the tree. The canvas bottom drawstring picking bucket is considered most desirable. Pickers should use their head as well as their hands in picking fruit and in treatment of the tree.

Grading, the operation between picking and packing, is generally neglected by the small apple grower. Apples are graded for size, for color, and for quality. This work should be done before packing is begun.

Packing in the generally used box 10½ by 11½ by 18 inches and the special box 10 by 11 by 20, inside measurements, establishes the commercial pack. Other sized boxes are considered obsolete. The diagonal pack is preferred as it permits of a wider variation in size of fruit and allows more or less pressure without bruising the fruit. However, for some sizes of apples one is forced to use the straight pack. When the grading is honestly done the question of the pack is readily determined. The wise growers and packers have availed themselves of the protection extended to them by the 1917 Standard Apple Act and will be governed by it in grading and packing their fruit and marking their packages.

Transportation facilities have rapidly assumed new phases in the past few years. New factors entering into the business are parcel post, motor vehicle, water via Panama Canal, improved express service, adequate car refrigeration. The first two factors properly applied should greatly reduce the transportation problems of the small grower and those in remote sections. The decided improvement attained by rail and water, when not disturbed by abnormal conditions, should result in greatly benefiting the California apple grower.

COTTON IN IMPERIAL COUNTY.

By F. W. Waite, County Horticultural Commissioner, El Centro, Cal.

In the year 1902 a few cotton plants were grown at Calexico and in the year 1904 there were small plantings of cotton by farmers who believed in the Imperial Valley as a cotton-producing section. These plantings, in an experimental way, were carried on each year for four years, during which time it was not possible to interest the farmers in the planting of cotton in commercial quantities because raising cantaloupes at that time was very profitable.

In 1909 cotton was grown commercially, some farmers having signed an agreement to plant about 1,200 acres, thereby being assured the erection of a cotton gin. Many acres were not cared for at all and due to the lack of experience, many growers having not even seen a cotton field before (including the writer), the yield was very light, there being only 350 bales ginned. The result, however, was very satisfactory and cotton growing was permanently established in the valley.

The acreage has increased during the years that have followed. Gins have been constructed in all parts of the valley, as well as oil mills, the latter manufacturing the seed into oil and meal.

The acreage in 1910 was increased about eight times over that of the preceding year. As there was considerable enthusiasm as to the possible profits in the cotton culture in this valley, many went into the business without previous experience, undertaking too large an acreage, the result being somewhat disappointing. The yield was very low and only 4,000 bales were ginned. The results to those who knew and to others who gained by experience, still being encouraging, the planting in the year 1911 was increased to about 12,000 acres. Enthusiasm being great, many entered the business without experience and the final results were an improvement on the year 1910, as about 9,000 bales were ginned. In 1912 the acreage was quite extensively reduced, there being only 8,300 acres planted. However, the production was much more satisfactory, as 7,200 bales were ginned, which made the yield per acre very great. This great yield was the result of the progress made by those new in the business and the growers acquiring experience in cotton growing under the conditions prevailing here. The result was a great advancement. During the season 1913 there were 26,000 acres planted, including the delta across the line in Lower California (Mexican territory). Due to the shortage of water in some localities and inadequate labor conditions, also a few inexperienced enthusiasts, there were only about 21,500 acres actually cultivated and 21,000 bales of cotton ginned. In 1914, 70,000 acres were planted and 44,697 bales of cotton ginned. In 1915, 45,000 acres were planted and 28,110 bales of cotton ginned. In 1916, 93,000 acres were planted and 63,160 bales of cotton ginned. This year there are 110,000 acres planted in the valley on both sides of the line. Ginning has just begun (September, 1917). The crop will be below normal due to the shortage of water mainly caused by the district being kept from constructing a weir across the river.

This department fully believes that water shortages are things of the past, as construction is going on by the directors of the irrigation district to ever prevent any further shortage.

During the several seasons past there have been few failures, a number of partial failures, and many successes—the same conditions that exist in all lines of enterprise. The failures were mostly due to poor condition of the ground for irrigation, as well as poor soil for cotton and also to lack of experience.

As cotton is a sun plant the climatic conditions are all that could be desired, practically no rain, ample water for irrigation, warm nights, sunlight and heat; in fact, all that seems necessary to produce the maximum yield of cotton for those who know how. On account of the continuous sunshine there is a very long season for picking, or from September to February or March.

As to insect pests there are a few common insects that do a small amount of damage. Those of enough importance to mention are the tarnished plant bug (*Lygus pratensis*), cotton leaf perforator (*Bucculatrix* sp.), cotton boll worm (*Heliothis obsoleta*), crickets, grasshoppers and plant lice. These insects do not do enough damage to warrant the use of any control method excepting when the grasshoppers in some particular locality get too numerous.

In reference to the very serious insects, the boll weevil and pink boll worm, we have neither. Many parties have said that the cotton boll weevil can not live in this climate, but this department takes the stand with men of knowledge and experience along this line, that it is possible and probable that an insect will live where the host plant lives, therefore, we are not taking any chances and guard all avenues of

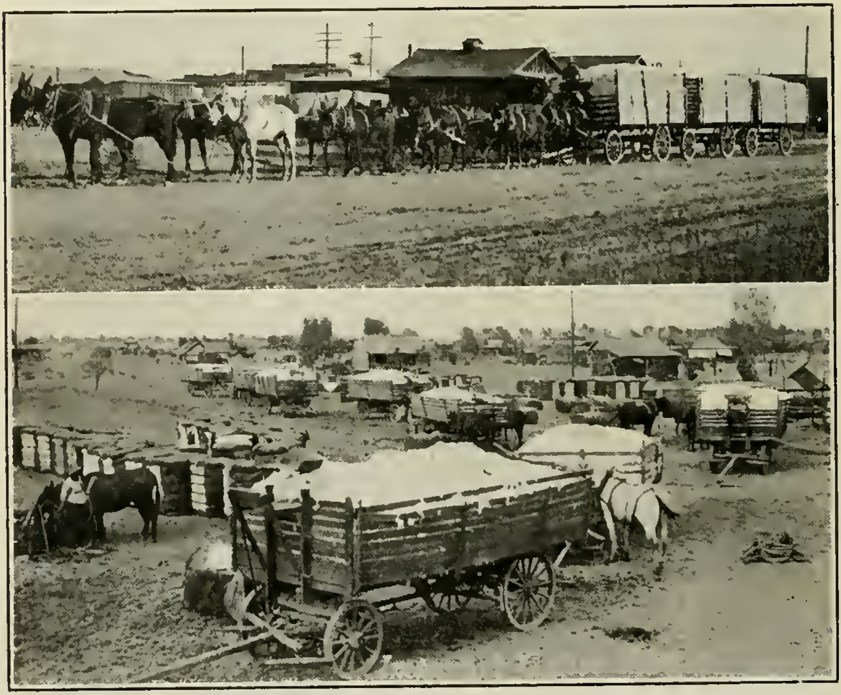

FIG. 136. Imperial Valley cotton in transit to the mills. (Original.)

approach. A state quarantine is in effect, prohibiting cotton seed to enter the state from anywhere excepting from Maricopa County, Arizona, and for experimental purposes.

Several varieties of cotton have been grown, but the principal ones are Upland (short staple) and Durango (long staple). The growers are about evenly divided in growing the above varieties.

Egyptian cotton (very long staple) has been grown in the southwest since 1902 in an experimental way. The last few years it has been grown commercially and very successfully. In Salt River Valley near Phoenix, Arizona, Egyptian is grown exclusively, and with the price of this cotton about three times higher in value than short staple and also ideal conditions for growing the Egyptian, I predict that the time will come when it will be grown exclusively in this county. The yield is not usually as large as short staple, but a bale and a half has been grown in this county under direction of the United States Experimental Station located at Bard. It costs about the same to grow, but two or three times more to pick.

A few growers have grown two bales of short staple to the acre, some a bale and a half, and many one bale, which gives an idea what the possibilities are to those who know the business. Present prices are 24 cents for short staple, 34 cents for Durango, and 80 cents to $1.00 for Egyptian, and $50 a ton for cotton seed.

California, according to the Census Bureau, United States Department of Commerce, has the highest yield per acre in the United States, or 400 pounds lint. The average for the United States is 156 pounds. The average price per pound in California in 1916 was 20 cents, or the highest price in the United States, the average price being 19.1 cents. The average return for California was $80 per acre, while the average return in the United States per acre was $29.79, therefore, California leads again. This proves that California can and does produce the finest cotton in the United States.

There are thirty gins, two compresses, and three oil mills in the valley and one oil mill in Los Angeles, which is equipment enough to handle all the cotton which could be produced on 300,000 acres.

HORTICULTURAL INSPECTION DIFFICULTIES IN INYO COUNTY.

By E. M. Nordyke, County Horticultural Commissioner, Bishop, Cal.

Horticultural inspection applied to a region that is in a sense comparatively new in the development of its fruit industry as a merchantable factor, is by no means an easy task. The production of first-class various deciduous fruits has long since passed the experimental stage in the Owens River Valley. Fruit-tree planting dates back as far as 1877, clean fruit being produced until the introduction of the codling moth, which occurred in the latter part of the nineties. During the years following insect pests gained a strong foothold, and until within the past two years only spasmodic efforts were made toward control measures. So firmly were some of the pests established that any attempt at their control was a monumental undertaking.

The older and bearing orchards are scattered over a territory 120 miles long by 15 miles wide. The task of covering this large territory confronted the commissioner when he began work in Inyo County. The problem of introducing methods of control practically new to this section required first an educational campaign. The first difficulty in the inspection after so long a period had elapsed, in which but little, if any, attention had been given the subject, was to get a majority of the growers to see the necessity of locating the pests and diseases, then applying the remedy. Several infested orchards were located and control measures were used with good results. Inspection of several orchards revealed such an infestation of pests and diseases, due perhaps to neglect, that the ax and dynamite were used to destroy the trees.

In close relation to the inspection and inseparable from it lie the control and eradication troubles. Generally the man with a young orchard gladly does all he can to ward off the destructive pests and, as the real commercial planting of fruit trees began only five years ago with the incoming to the valley of new purchasers of land, this locality may be termed to be yet in its infancy in the fruit game, consequently this yearly increase in acreage is fast becoming a prominent factor in assisting the inspection work of the county. We have men engaged in the fruit industry now who have had successful experience in the same line of work in other places, they being our largest fruit growers. These people are adopting the improved methods of fruit culture, thus giving the industry an additional impetus greatly aiding the inspection work by the proofs of the efficiency of such work. The inspection of older infested orchards combined with control measures has been the first duty of this office and now with our stronger horticultural laws the work will be made much lighter.

Many difficulties are encountered in the inspection of the incoming nursery stock. These, no doubt, exist in all places, but it might be of interest to some to point out local difficulties peculiar to Inyo. Railroad stations are as yet several miles from the towns and agricultural districts. Vast acres of undeveloped land must be traveled over to reach the stations and the orchard plantings as well. The establishment of a central place to which all shipments could come was seriously considered. This would lighten the work of inspection to a large extent in point of travel but would necessitate the work of repacking in a careful manner all shipments for the reshipping to their destination, thus causing delay and dissatisfaction on the part of the shipper and consignee.

To obviate the difficulties of depot inspection work arrangements have been made with all freight agents and express agents to notify the commissioner's office by phone of the arrival of any shipment that comes under horticultural inspection. If the office where such shipment is received can not be reached in a few hours the agent is authorized to tack a release card (a supply of which is furnished) on the shipment authorizing its release to the consignee, subject to inspection before planting. In this way the person receiving the goods, knowing in what condition they arrive, is much better satisfied with the inspection work.

SUGGESTIONS ON WEED CONTROL.

By **Kent S. Knowlton**, County Horticultural Commissioner, Bakersfield, Cal.

In writing this article I do not offer it as a scientific dissertation on the eradication and control of weeds, but do offer it with a sincere hope that it may be of some value to a fellow commissioner who is now engaged or is about to undertake a campaign against noxious weeds in his county. We are now finishing our fifth year of continuous warfare against noxious weeds in this county with good and only partial results in the various districts.

In looking back over our work one feels as though he were finishing a hard day's labor and turns once again to see the results he has obtained. Right here let me say that there can be no possible success without a thoroughly complete organization, and the amount of success is in direct proportion to the completeness of the system, and the organization of the farmers and landowners, that they may have the proper understanding among themselves and heartily support the commissioner.

A weed campaign must necessarily emanate from the landowners themselves, with the commissioner as a means of bringing about the desired results by keeping this organized machinery continually operating as smoothly as possible. In one of the districts in this county where we have secured the poorest results I would say it was through our failure to get the farmers to cooperate with each other.

I will not touch on the field methods of eradication and control of the various weeds, for so many articles have been written on this subject that what I could write would probably be a repetition, but I will offer a few suggestions that will be of interest especially to the commissioners of the state. If any county has been so fortunate as to be entirely free from two of our serious pests there is reason for thankfulness. Caltrop or ground burr nut (*Tribulus terrestris*) and the sand burr grass (*Cenchrus tribuloides*) are our worst weed pests. They are costing our county thousands of dollars to control aside from the many thousands of dollars damage to crops and stock.

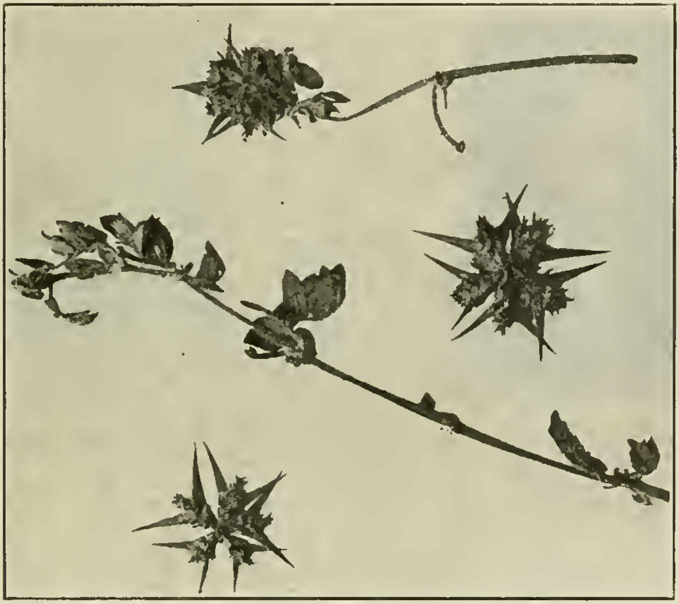

FIG. 137. The Caltrop or ground bur-nut, *Tribulus terrestris*. The plant spreads over the ground in a dense mat heavily loaded with long sharp hexagonal seed pods. The points of these seeds are sharp enough to puncture an ordinary bicycle tire. (State Comm. of Hort.)

One of my neighboring horticultural commissioners of the north writes and asks if I do not think that to eradicate the caltrop in the county would be as expensive as to eradicate the ground squirrel. My answer is "yes!" and emphatically so, if eradication is possible, but this we have been unable to bring about but have thought ourselves fortunate where we have been able to control it. So, my fellow horticultural commissioner, if you are so fortunate as not to know these weeds, and not having had them in your county, I would suggest that you send for specimens which I would gladly supply. If only a light infestation is in your county stamp it out at any cost. Here can be a demonstration of the possibility and practicability of completely eradicating this serious weed pest even at heavy expense. I believe there can be nothing to hinder a weed campaign in a district more than one weedy ranch on which there has been no work done, and last but not least, I would say whatever is begun finish at any cost. It may look pretty discouraging to begin some forced work in a district where there are thousands or acres of weed-infested land, but as soon as a single job has been finished with satisfactory results it carries more weight and results than ever could be written into the statutes of the state of California or voiced by the word of man.

THE MEALY BUG PROBLEM OF GRAPES.

By **Fred K. Howard**, County Horticultural Commissioner, Hanford, Cal.

A packer lifts from the box at her side a beautiful bunch of malagas. To the eye of the casual observer it is a perfect specimen of this variety of grapes, but for some reason, after a hasty glance over them, the cluster is quickly thrown into the cull box below. She has detected the clear, crystal globules of honey dew on the berries which indicates the presence of an insect which today furnishes one of the big problems of the grape growers of the state, for the insect, the mealy bug (*Pseudococcus bakeri*) is known to infest grapes in nearly all sections of the San Joaquin Valley, as well as parts of the Sacramento Valley.

Because fruit that is thus infested can not be shipped and because drying raisins are more susceptible to smut fungus and dry rot the problem has received considerable attention from growers, packers and investigators.

It appears that soon after the last moult, the adult females of the mealybug make their way to the maturing grape clusters, settle down and feed on the juicy berries, usually at or near the stem end. Perhaps it is because of the plentiful food supply that such large quantities of honey dew are exuded, for it takes but a short time for a few insects to give a cluster of grapes a very unappetizing appearance. It is to be regretted that grapes thus infested are often picked and hauled to the packing houses and the insects, being disturbed, will seek out secluded spots in the cracks of the boxes which may or may not belong to the same vineyard and they are thus spread from place to place throughout the district.

That all boxes returning from packing houses should be fumigated is unquestioned, but the time coming, as it does when each moment counts in quality of product and price received, makes this an important problem for the vineyardist to consider.

Just what will be the final results of the experiments which Mr. R. L. Nougaret, entomologist for the United States Department of Agriculture, is conducting, it is at present impossible to say. Enough has been done, however, to indicate that the control problem will not be an easy one.

In the early stages of the experimental work it is clearly shown that control measures of any sort could not be adopted during the growing season, and later work has shown that the only period when successful work could be done is during the first warm spring days before the leaves appear. It is at this time when the greatest number of the young insects, which have wintered over in the egg sacks underneath the old bark of the vines and other secluded places, are to be found feeding on the tender cambium of the spurs which they reach through the cracks in the outer bark, caused by the blunt blade of the pruning shears. At this time a driving spray of the proper material forced into these cracks and crevices, does very good work. Experience has shown, however, that the man doing the spraying must understand the habits of the insects and use this knowledge when applying the spray, for unless the man handling the nozzle directs the spray toward the crevices where the insects are most liable to be found, from almost every angle, the percentage of kill will be very unsatisfactory.

Control measures are thus made more difficult, for it is practically impossible to get men who have sufficient training to enable them to do this sort of work in a satisfactory manner. With the spraying time limited to not more than two weeks in the spring and with the cost of application almost prohibitive, the problem is made most serious, for spraying seems to be the only logical method of control.

PEAR BLIGHT CONTROL IN LAKE COUNTY.

By Fred G. Stokes, County Horticultural Commissioner, Kelseyville, Cal.

Thanks to the vigilance and fighting spirit of the Lake County pear men the blight, though somewhat spasmodically with us here and there for the past eight years, has not yet put one orchard out of commission nor retarded the planting out of Bartlett pears. The last two years have been bad ones for blight, throughout this state, and also Oregon, but Lake County is courageously planting out more pears yearly, in 1917 putting out over 40,000, an increase of 10,000 above the previous season. Some orchards have hardly been affected at all and others, having a bad attack one season, have for years been practically free from reinfestation. For instance, eight years ago Mr. L. Sailor's 12½-acre Bartlett orchard, in Scotts Valley, had a severe attack, and though he put up a good fight by the cutting-out method, yet he lost or cut to the ground some 200 trees. The next year the infection was light and for the past five years he has had no tree loss and practically no blight fight. This season the crop from this orchard was 120 tons. It was sold at $36 a ton to a local dry yard.

We have come to the conclusion that to successfully control blight the apple orchards must be attended to as well as the pears. All sources of carry-over and infection must be carefully sought and suppressed. An odd, blighted Spitzenberg or other apple tree, left here and there neglected, is a menace to the pear industry. With such trees around the pear grower has a permanent yearly blight fight on his hands. Many trees are unprofitable anyway, and in such cases should either be dehorned and grafted to a variety less susceptible to blight or dynamited out. Last year we made a "dead set" at such trees and generally received the hearty support of the owners. In this county there is good money in the Bartlett and very little, comparatively, in the apple. Most people realize this and even if not, commercial orchardists are willing to attend to such trees *pro bono publico*. In cases of ignorance or carelessness we serve notice, and if they do not get busy within a reasonable time, do the work for them, the same becoming a lien on their property.

Fortunately the Lake County pear growers are keen on protecting their orchards and the majority being familiar with the malignant nature of this bacterial disease, need little coercion in immediately getting busy as soon as the first blight cases appear. Though cutting out the diseased twigs and limbs well below visible sign of infection and keeping tools, *i. e.*, shears, saw and bark scraper, disinfected after each cut, with corrosive sublimate (1-1,000) sounds easy, it takes practice and experience to do good work and every season one gets better results. It pays to be posted on the latest methods and to keep in touch with the State Horticultural Commission and the University of California. From time to time valuable advice has been given by Prof. R. E. Smith, who has visited our county, noting our blight work and advising on other knotty problems. Prof. S. S. Rogers of the State Farm at Davis came likewise on the same errand and gave some valuable tips about bark scraping, etc. A county horticultural commissioner always learns something from such men, and in many ways during my three years of service I have found the University of California invaluable. In the same category the State Commission of Horticulture, the clearing house for all our problems, has continually advised and guided. The visits of State Horticultural Commissioner G. H. Hecke and Chief Deputy G. P. Weldon stimulate and tone our action.

For the past two seasons, accompanied by leading Lake County pear growers, I have visited the orchards of such blight fighters as Messrs. Heyward Reed and E. A. Gammon near Sacramento, and accompanied by that indefatigable pear expert, G. P. Weldon, have found such visits profitable and well worth while to any pear grower who wishes to be up to date on blight fighting. Our trips have been made when they commence pear picking, this year July 7, and it is with great satisfaction and encouragement that we see these men capture enormous crops and stay with and increase their business, in spite of blight. This season we could find scarcely a visible case of blight in Mr. Gammon's orchard, and yet he stated there was a bad blight attack in the spring. He immediately put on men to cut it out, having as many as 25 employed in the work at one time, the entire job costing $1,500. This sounds a big expenditure, but when we know that he sold a big crop of pears at a good figure, it was comparatively small and the orchard was left in good condition for another season.

The cutting-out method is by no means satisfactory, but so far is all we have. Experiments have been made in inoculation, tending to tree immunity, but so far unsuccessfully. Let us hope that eventually such experiments may lead to success. Last summer some promising investigations of pear blight bacteria were made by C. Laughlin, a pharmaceutical chemist having an orchard in Lake County. Work was done with artificial cultures and tree inoculation, the idea being to produce immunity, either whole or partial, against the bacteria. Our control methods "in a nutshell" at present are: close inspection of all apple and pear orchards just after blossoming time; notification of owners or tenants wherever neglected trees are found and coercion if necessary when cases are unattended to; disinfection of tools with corrosive sublimate, 1-1,000 (retaining same in glass or applying with swab); keeping water sprouts from growing at the base of trees and keeping lower limbs free from fruit spurs; special clean up of any carry-over in the fall before regular pruning and while leaves are still on the trees; and general vigilance in the orchard at all times.

HORTICULTURE IN LASSEN COUNTY.

By A. H. Taylor, County Horticultural Commissioner, Susanville, Cal.

Lassen County, near the northeast corner of the state, but little known by the state at large, is a land of large possibilities that are slowly but surely being developed. An agriculturist passing through it is charmed by its large fertile valleys, covered as they are by a deep and very productive soil that makes large returns to those who cultivate it, even as it is done at present, in a rather primitive fashion.

The grains and grasses are successfully grown, and alfalfa especially is a money-making crop. It is largely grown here for seed, is taking first rank in its class and is eagerly bought by those who want only the best.

As an apple producing section we rank among the first. Our altitude ranges from 4,000 feet upward and our soil and climate combine to produce an apple that for color, size, flavor and quality is second to none anywhere grown. This may look like a strong claim, but we have the fruit in abundance to support it. Other fruits, especially under favorable conditions, are becoming well known and find a ready market, abroad as well as at home.

We can also raise remarkably fine potatoes. Who would eat a valley grown "spud" when the fine stock raised in the mountains can be had. Again nature and location work together to give us the best to be had in the market for table use.

With these, so briefly mentioned, and many other advantages that can not now be touched on, our county well merits the slogan adopted for the P. P. I. E.—Lucky Land of Lassen.

FORCED CONTROL OF INSECT PESTS IN LOS ANGELES COUNTY.

By WILLIAM WOOD, County Horticultural Commissioner, Los Angeles, Cal.

In Los Angeles County, unlike most others in California, the lands are held in smaller tracts. The crops are more diversified and naturally we have more harmful insects and plant diseases to contend with than in most of the other counties of the state.

When we consider the great variety of plants and trees growing in Los Angeles County and that nearly all are host plants for some kind of insect pest, one should not wonder when told that more than a quarter of a million dollars is spent every year in their control. It should not seem strange, if among all of the thousands of growers, there were some who through lack of means, or through shiftlessness or poor management, allowed their trees and plants to become infested with insect pests and diseases to the great detriment of themselves and a menace to the surrounding community.

Whenever this condition exists, many who would control their pests under more favorable conditions, become discouraged and help to swell the list of those with infested and unprofitable crops. Fortunately, the number of these is small when compared with the whole; and for this reason, our state legislature has, during the past thirty years, enacted horticultural laws meant to protect those who would help themselves against the few who would maintain a nuisance that is a detriment to themselves and a menace to the surrounding community. But like most laws, defects were found that often prevented their enforcement. Some of these defects were eliminated from time to time, but not until the last session of the legislature was there any real, substantial change made that would strengthen the horticultural laws and make them adequate to cover every emergency that might arise.

The addition of the word "control" to our law must certainly be a great relief to every commissioner and inspector. In collecting the bills for work done by the county, the owners of trees have almost invariably complained and many have contended that all insects were not eradicated and for this reason they should not be compelled to pay the bill. The word "control" removes this annoying feature.

The addition to section 2319c of the Political Code which provides that no quarantine shall be established, maintained nor enforced except by the state commissioner, has done away with all the different county quarantine ordinances; making a uniform quarantine regulation throughout the state, thereby removing just cause for complaint by the nurserymen.

The new law that makes a horticultural lien for work done by the county hold over a mortgage will be a great help in the enforced cleaning up of run-down, mortgaged groves which are invariably badly infested with insect pests and diseases. Heretofore, in cases where the groves were mortgaged for all and sometimes more than they were worth; neither the owner nor the mortgagee would consent to have the work done; and if the county forced the work there was no security for the cost; consequently, such groves were left untreated to become a greater menace to the surrounding groves. This new law makes a lien for forced horticultural work take precedence over all claims except taxes and has removed the greatest difficulty with which the county horticultural commissioner has ever had to contend.

How the Work for Forced Control Is Done.

First, our county is divided into twenty districts. Each district has an inspector whose duty is to make a general inspection of as many of the orchards and crops growing in his district as he can throughout the year. In most districts the inspector can not cover more than half of the territory in a year and as the custom has been in most districts to destroy the insects every other year, one inspector has been sufficient to do the work thought necessary for a whole district. I might add that this inspector is also expected to pass on all trees, plants and vines coming into and going out of his district, and to see that the horticultural law is complied with in every case.

During the first part of the year when there are but few shipments of nursery stock moving, the inspector spends his time in the groves that will need treatment for the control of insects in the part of his district that is to be treated that year. About a month before the time for treatment work, the inspector begins to get the data in regard to owners and locations of property to be treated and sends the information into the office. Our searcher of records looks up the records of each piece of property, maps it, gets the correct legal descriptions and the name and address of the owner to be notified so that when the notice is served, we know that the right owner or some one in charge has been properly served with a notice that is legal.

The time given the owner in which to do the work is usually ten days and if at the expiration of that time the work is not done, as soon thereafter as the county outfits can do the work, it is done and the data relating to it is sent in to the office where the cost is estimated and bills promptly sent to owners. A very large per cent of the work we do is promptly paid for. Our fumigators and sprayers are paid twice a month and for all bills for work not paid by the owners in thirty days after the county has paid for the work a lien is filed against the property to secure to the county the cost of the work.

This county owns one hundred and eight fumigation tents and one power spraying machine. The tents are operated by four crews, each working in a different part of the county, but these are not sufficient to do all of the work that should be done by the county so we are compelled to let out to the lowest bidder, all of the work done in Pasadena, South Pasadena and vicinity—some twelve or fifteen thousand dollars worth of work each season. Any orchard work that we are compelled to do, is let out to independent companies who are better prepared to do that kind of work than is the county.

The kind of work that we do is on small lots that the independent companies will not do and work that we have to force to be done. This latter work done against the wishes of the owners is work that tries the patience of the horticultural commissioner. They feel that we have encroached upon their rights and they can always find something to "kick" about. We have not killed all of the insects, or we have ruined the tree, or we have trampled the flowers, or we have broken the clotheslines and numerous other things for which they claim damages much greater than the cost of the work.

In every case of this kind I have the inspector investigate and report his findings. If real damage has been done I go personally and in nearly every case succeed in making a satisfactory settlement. Sometimes an unreasonable complaint is brought to the supervisors who, in most cases, are inclined to believe that there is some ground for complaint—which means more time and expense—only to find that no real damage has been done and no reason for complaint.

These are some of the annoying features that the horticultural commissioner has to contend with when enforcing the control of insects and diseases on plants and trees. Some of the more pleasant features of this work are found in the fact that forced work represents only a small per cent of the total insect and disease control work of this county. Not more than 1 per cent of the orchard fumigation and spray work has to be done by the county. More than one-half of all fumigation work is done by the different citrus associations. It is very seldom that the county outfits have a job of more than fifty trees. Fully 75 per cent of the owners of small lots of trees take a pride in their trees and desire that they be kept clean and healthy and therefore welcome the work done by the county and demand that their neighbor's trees receive similar treatment.

INSPECTION AT POINT OF ORIGIN.

By GEO. MARCHBANK, County Horticultural Commissioner, Madera, Cal.

This is a subject that looks very simple at first glance, but the more angles we view it from, the more complicated it becomes. The subject was suggested; had I followed my own inclination, I would have chosen one more easy. I think most of us will agree that the best time and place to thoroughly inspect nursery stock is at the digging time, in the nursery, when the trees are being dug and pulled from the ground.

Digging Trees—The digger used in the nursery is a large U-shaped implement drawn by from ten to sixteen large mules (number varies with size of the trees and condition of the soil). This implement, as the name would imply, does not remove the trees from the ground, but merely severs the roots at a good depth. The men who follow the digger are divided into several sections or crews. First come the pullers who pull the trees out of the ground. These men are required to remove as much earth from the trees as possible, by shaking or jarring, and to be on the outlook for crowngall, and when any is observed the tree is broken and thrown to one side to be later burned. Next come the graders, who take the tree with one hand and with the palm of the other (the use of the pruning shears for this purpose is discouraged to prevent injury) give the base of the tree a sharp blow or two to remove all the soil possible so that the root system will be visible. These men are required to make a very minute inspection of every tree before grading as to size. The inspector follows the graders to detect anything that might slip through unnoticed by the pullers and graders so that every tree is inspected three times before it is removed from the ground and heeled in.

Reinfestation—Apples and pears where wooly aphis exists, may become reinfested while heeled in, in the nursery, or sales-yard, and these trees should always be inspected again at the packing shed before shipment is made.

In the case of hothouse plants and citrus trees, a single inspection would not sufficiently protect the grower, for at the point of origin the plants may be apparently clean, yet the mealy bug and red scale be present in the egg state or in so minute a form as not to be observed, and develop on the journey so that a number of examples might be cited wherein inspection at the point of origin would not sufficiently protect.

Deciduous Trees—I am of the opinion that if all deciduous nursery stock were handled as heretofore described, it would save a great deal of time, trouble, and expense and would result in great efficiency and economy. As to the value of such an inspection, the whole matter, it would appear to me, rests on the question: Can men be trusted to inspect with the same degree of exactness at the point of origin as they do at the point of destination? I think they can if it is required of them.

HORTICULTURAL COMMISSIONER PROBLEMS IN MARIN COUNTY.

By Thomas P. Redmayne, County Horticultural Commissioner, San Rafael, Cal.

Marin County as yet ranks rather low in the list of commercial fruit growing sections, although portions of the county are well adapted to deciduous fruits. When our growers fully realize the importance of up-to-date methods and the necessity of going to the expense of keeping injurious insect pests and diseases in subjection to insure profitable returns the industry is sure to expand.

Potato growing is of some importance and field beans are being tried this year. The acreage of young pear trees greatly exceeds that of bearing trees. Vegetables and hay are raised to some extent but not in sufficient quantity to supply the local demand.

A far larger investment however lies in ornamentals, for southern Marin is a county of beautiful homes where the natural scenery is an advantage. Trees and plants from all parts of the world are planted in conjunction with our native sorts. Owing to the great variety of plants there naturally is a great variety of their enemies. However there have been few serious outbreaks.

The most common and persistent pests, and which probably do the most damage all around, are the various aphids. Large quantities of our native ladybird beetles breed in the hills of the county and do excellent work in controlling these pests but owing to their late appearance in the orchards spraying is necessary to prevent injury to the young fruit. The scale insects are a close second in importance and as many of them have a wide range of host plants including the native species, they are the hardest to control, spraying or fumigating in most cases being impracticable. However at present, with local exceptions, none of these are very serious among the fruits. Prunes in one locality suffered considerably from an attack of the European fruit lecanium. The black scale in the past was very serious both among ornamentals and fruits but thanks to our little friend the *Scutellista* is now greatly reduced. The cottony cushion scale, formerly a serious menace, more particularly among certain ornamentals, is pretty well under control, yet owing to its prolific nature needs close watching. It is to be regretted that there is not a better supply of the *Vedalia* for this little beetle does good work, yet for some reason does not multiply like some of the others.

While in the coast section apples are free or practically so of the codling moth larvæ, in the interior the case is the reverse. Owing to the lack of funds it is impossible to carry out the law in abating this nuisance and dependence has to be made on voluntary action on the part of the growers and bringing them to a realization that it is to their personal profit to produce clean fruit. No doubt the new standard apple act will help bring results.

The growing of commercial currants has practically been abandoned owing to the currant fruit fly. A small indication is seen in the work of this pest of what the introduction of the Mediterranean fruit-fly with its omnivorous habit might prove.

Unless proper treatment is given, many of those experimenting with field bean growing are likely to be discouraged owing to the prevalence of the two-spotted mite, but where tried the dry sulphur has proven to be a very satisfactory treatment.

Among the weed pests a species of lupine causes much trouble in one section and is apparently as hard to eradicate or control as the morning-glory, being a perennial and growing by root division in a similar manner.

Fortunately the ground squirrel is practically extinct in the county. Complaints have been received of damage by the California linnet, not only to the various ripening fruits but to the destruction of the fruit buds in early spring, particularly of the prune and plum. In some cases the writer was shown trees that were practically stripped. In one case prune trees in the nursery rows were rendered unfit for planting, all the buds being removed. A suggestion has been made of the addition of arsenate of lead or paris green to the usual spray as a bud protection.

As in some others of the counties, where the appropriation for the work is so limited that the appointment of local inspectors is out of the question, the commissioner at times is at his wits end to carry out the necessary quarantine work. He has to travel to cover his county. This means expense and eats into what should be his salary. The quarantine must be carried out thoroughly to be effective and in order to perform his work conscientiously he has to exceed his limit many times. He is told he must keep within the amount and therefore has to pocket the loss. While he is still busy with his quarantine work the time for spraying is on and little show he has for a campaign in that line. He must do his educational work with the grower after the pest has got in its work and it is probably forgotten when the proper season comes again. But as the dropping water wears the hard stone so the constant plodding tells. Progress is continually being made and will no doubt go on at increased ratio.

PEAR SCAB EXPERIENCES.

By Claude Van Dyke, County Horticultural Commissioner, Ukiah, Cal.

If the pear grower, who is harrowed and wrought to anger by the ravages of pear scab, is to be permitted to rest and completely forget this invader during any time of the year it should be during the present month (October). But as the pear growers, generally, are in a splendid mood for punishment at this time I shall again revive the worn subject and relate a few conclusions at which the producers of this section have arrived. These conclusions are based upon observations made during the past three years, the first two of which were very favorable to scab production.

Our orchards, when properly sprayed to control scab, need no dormant or early winter spraying. It is found that after the trees have been sprayed and resprayed several times with fungicides and insecticides which go to complete the scab campaign, a timid litle pernicious scale will never get settled nor will a particle of moss get started. Likewise a fall spraying is of no value in preventing the attack of the disease the following spring. I make this statement since it has proved to be impossible to eradicate the spores of the fungus entirely and work done during early winter must simply be repeated later. It is more economical then to save the material and energy for the spring drive which starts with the growing season.

All available materials in the nature of spray combinations, including commercial preparations with both sulfur and copper sulfate as basic ingredients, have been tried. In the successive use of these the unusual has happened. Instead of each grower finding some different material with which he had satisfactory results, practically all combinations were discarded as unsatisfactory and the survivors were lime-sulfur and Bordeaux mixture.

In this county, the past three years have marked the decline in popularity of the copper sulfate and lime combination, and the increasing favor of the lime-sulfur solution. There are several factors which augment the growing favor of the latter aside from its fungicidal value. It is less expensive, simpler to prepare and easier to apply. It is generally conceded, however, that there is a greater chance of "burning" through its use than through the use of the Bordeaux mixture. From the comparative percentages of clean fruit resulting from the use of these two fungicides the writer is unable to say one is more effective than the other. There is apparently no choice.

What is true with the control of many other fungus diseases of fruit holds true with pear scab in the time of application of the fungicide. This is of first importance. Owing to weather conditions it is not always possible to complete the work at the precise time which is thought to be best; but the effort of the grower should be to do the spraying in three successive periods as nearly as possible as follows:

> *First spraying*: Using four gallons lime-sulfur solution (35° Baume) to 100 gallons water, applied as the bud clusters are quite open but well before the blossom buds are open.
>
> *Second spraying*: Using three gallons solution to 100 gallons water applied as the blossom petals are beginning to fall.
>
> *Third spraying*: Using three gallons solution to 100 gallons water applied about one week later.

As the fungus is often visible before the blossom petals have fallen it is necessary that the first application be made before blooming and this is done when the buds are most accessible. Arsenate of lead for codling moth control is combined with the last spraying for scab. It is impossible to find all the bud clusters just right at any one time as some are always slower than others in opening. As to the best time during this period of a few days the operator must be guided by his own judgment.

I might add in conclusion that Ukiah Valley had several absolute proofs this summer of the success possible in combating pear scab. One of our larger growers on a ten-acre bearing orchard had 5 per cent of the pears showing scab injury. The same grower left one small plot of about 100 trees unsprayed and 92 per cent of the pears were scabby. Several other examples as striking as this can be cited. We believe that the ordinary attack of this fungus, under normal weather conditions, can be completely controlled. We also believe that the method of control, under weather conditions particularly favorable to its development, and adverse to spraying operations, has not been found.

SWEET POTATOES IN MERCED COUNTY.

By Arthur E. Beers, County Horticultural Commissioner, Merced, Cal.

Half the sweet potatoes produced in California are grown in Merced County, if the U. S. crop reporter's estimate of six thousand acres for the state is correct. Another third is grown in near-by Stanislaus County. Several Sacramento Valley counties have small acreages, while Orange County and Los Angeles County produce enough potatoes to supply southern California. Outside of California no sweet potatoes are grown west of the coast region of Texas. "Merced Sweets" are shipped in carload lots to all the northwestern states and western Canada and as far east as the Dakotas and Minnesota. This is little more than a good-sized sweet potato apiece for the population of this territory.

The commercial production of sweet potatoes requires a loose, sandy, but rich soil, with ample moisture, either from irrigation or a high water table. Moisture must not reach the tubers or they will quickly rot. After five or six crops have been taken from the ground, it is usual to set it to peach trees and complete the exhaustion of the soil, or to plant it to alfalfa to restore it for future crops of sweet potatoes.

The potatoes are grown from sprouts. The small unsalable potatoes are carefully stored over winter, and set out in the spring in hot beds to sprout. The field is thrown up in ridges and the sprouts are set on the ridges and watered at the same time by the aid of a special planter. The continued use of small potatoes for seed has tended to reduce the quality, when care has not been used in making selection. This year potatoes for sprouting were scarce, and four carloads were selected in Tennessee and shipped to Livingston and Atwater. These new potatoes are sweeter than those usually grown and seem to please the buyers. Sprouts are shipped to seed houses, growers and for family gardens to all parts of the state, every spring.

When dug, the potatoes are piled in the field until the weather gets cool or they are packed in crates holding one hundred pounds, or occasionally in half crates, and hauled to the loading shed. Unlike Irish potatoes, sweet potatoes must be kept warm, about 60 degrees, to prevent decay.

Sweet potato growing is hard, heavy work, and the growers, many of whom are Portuguese, deserve the prosperity they have enjoyed.

COMMON PESTS PREVALENT IN MODOC COUNTY.

By THOMAS BRILES, County Horticultural Commissioner, Davis Creek, Cal.

As Modoc County is not situated in the citrus belt of California and the fruit we grow is of the more hardy kind, we naturally have fewer insect pests to contend with than some of the more southern counties. Few as they are, however, it requires vigilance on the part of the horticultural commissioner and cooperation from the farmer and orchardist to control them.

We have very few commercial orchards as yet in Modoc County. The average orchard consists of from 20 to 150 trees of mixed fruit used principally in the home and, in general, the trees are more or less neglected, which is only natural where commercial value is not considered. However, our Modoc-grown fruit, especially apples, pears and cherries, are second to none and considerable of our foothill land especially adapted to fruit growing is being planted to orchard.

Our most common orchard pests are of the well-known kinds, namely, green and wooly apple aphis, codling moth and pear blight, but by proper spraying we keep them controlled beyond serious damage.

Codling moth exists in every locality in Modoc County but one, in New Pine Creek near the Oregon line, and the orchardists in this section are very vigilant as to its introduction.

Aphis, especially green apple aphis, is numerous in every section, but one winter spraying is usually all that is necessary to control.

Pear blight is prevalent throughout, but as each mixed orchard has only very few pear trees, cutting out at first appearance makes control in a measure easy.

The common cabbage worm was so numerous this season that the home garden usually suffered and, as a consequence, cabbage is being shipped into Alturas.

I have instructed a great many farmers who grow more cabbage than is used in the home, regarding the control of this pest, but as this county is one of so many industries, some of the smaller suffer in consequence.

As in many other counties, the most serious problem to be solved by the county horticultural commissioner of Modoc County is the eradication and control of ground squirrels and gophers. Our board of supervisors is to be commended for starting this good work three years ago by furnishing free poison to every farmer in Modoc County. However, on my trips over the county, by observation and inquiry, I learned that ground squirrels this year are more numerous than for several years, so in consequence it is easy to be seen that this matter can not be left to the farmer alone, although he is furnished with free poison. Modoc County will derive more benefit from squirrel and gopher eradication than similar work with all other pests combined, due to the fact that the chief industries are farming and stock raising. Our range and hay is the principal source of Modoc's wealth and when 5 per cent of the range alone is taken by squirrels the damage amounts to thousands of dollars, not counting the 15 or 20 per cent toll in grain fields. To rid each county of this most destructive pest will require a considerable outlay of money and full and earnest cooperation of farmers, supervisors and county horticulturists.

Weeds in Modoc consist chiefly of the common garden sorts such as wild mustard, pigweed, etc. Russian thistle has appeared in one locality only, covering an area of probably 160 acres. Canada thistle and morning-glory, in small patches, are more common. Generally speaking, however, noxious weeds are few and as large areas in this county are used for grazing I am going to use every precaution possible by cooperating with the range riders and the forest service to prevent the introduction of yellow star thistle and other weeds so detrimental to stock grazing.

The reader will understand that my work in Modoc County may differ very materially from that of horticultural commissioners in other counties, owing to the fact that it is much more common to see a herd of sheep or cattle numbering 500 to 5,000 head, than it is to see an orchard with a like number of fruit trees. The reason I mention this fact is to show the importance and absolute necessity to be up and in arms against the introduction of any foreign weed detrimental to the welfare of our principal industry, stock raising.

THE RUSSIAN THISTLE (*Salsola kali*: *variety tragus*), ITS CONTROL AND ERADICATION.

By J. B. Hickman, County Horticultural Commissioner, Aromas, Cal.

The Russian thistle is an annual having a central stalk with a taproot, from which the mature plant breaks away and, blown along over the ground, scatters seed broadcast. It is a dry-land plant, the seed germinating under light moisture. The young plants are green and tender in appearance—a food in this stage, relished by all stock and easily eradicated. The mature plants are rigid, spinous, dense and unapproachable; impossible to cut off by any ordinary implement where grown large under favorable conditions, as no hoe, grub ax or other like tool can reach the central stalk protected by the curving spinous branches.

Control of this weed pest as a preliminary step to its eradication seems to imply the prevention of its spread over new territory and necessitates the destruction of all plants prior to blooming and before they become large enough to be blown about by winds, as well as the prevention of infestation of hay or grain by mature specimens.

As barley is cut before the Russian thistle matures we need not expect to find it infested, but a shipment of wheat for chicken feed from a neighboring county had numerous fragments of mature Russian thistle plants in every sack, proving conclusively that Russian thistle ripens with wheat. In grain hay the danger lies in the plants that are caught by the buckrake when carrying seasoned hay shocks to the baler. While seeds of Russian thistle are so sensitive to excess of moisture that they rarely sprout or thrive in alfalfa checks, they do thrive on the levees, and by the time the third or fourth cutting is ready may have mature seed, be baled with the hay and so carry the infestation indefinitely. Monterey County, without doubt received most, if not all, of its early infestation through infested alfalfa seed. Its appearance was first noticed in at least three instances in newly-planted alfalfa.

The seeds retain their vitality but two years at best, and when crowded or shaded by other plants, even if it be warm enough to germinate the seeds, the seedlings smother before maturing.

Aside from natural and usual transportation avenues for spreading its seeds, muddy wagon wheels driven through infested areas will sometimes do considerable harm. In one case in this county, this was the cause of a double row of neatly drilled in Russian thistle in a warm sandblow the following summer. Incidentally such wagon wheels traversing highways plant seeds at widely distant points and such new infestations make necessary the utmost watchfulness and solicitude on the part of inspectors.

One public spirited citizen of Metz has come to know what the Russian thistle means, and it is largely due to his watchfulness and unselfishness that the road from Soledad to King City is free from Russian thistle. He knows the pest and when he sees one he gets down from his wagon and eradicates it. Would there were more like him. In contrast with our friend from Metz, let us cite a friend from a near-by community who cultivated a field of peas quite thoroughly and left a dozen fine specimens of Russian thistle to blow, when mature, over an unprotected area. Again, a considerable area cultivated to beans this season, quite free from other weeds, presented a hundred or more thrifty plants of our pest to re-seed the very field, for the cleaning up of which beans had been planted.

This brings us to one of the most difficult problems in weed eradication, namely, that of getting uniform care from all parties. One man is careful and painstaking while his neighbor is shiftless and allows weeds to grow which continually re-seed the clean land.

Large estates are leased to tenants, whose leases usually specify control of noxious weeds but whose landlords wish the stubble for pasture and object to plowing. Hand labor is out of the question and when the tenant starts plowing weeds have matured and spread their seeds.

Eradication of Russian thistle requires recognition of the plant as seedling and in its various mature forms. The bright green, long-leaved seedlings, if stunted from lack of moisture, may bloom and develop seeds when but a few inches high and require close observation for detection. Where conditions favor, the seedlings develop into delicate branching plants of beautiful green, readily eaten by stock; but as blooming time approaches, the narrow green leaves wither, the spiny bracts develop, and the small pinkish blossoms (less than a quarter of an inch in diameter) appear. When not crowded and conditions favor, plants develop into a flattened globular shape, often four feet in diameter, three feet high, and producing many thousand seeds which are scattered as the mature plants, after breaking loose from the ground, go rolling and tumbling before the wind.

As Russian thistle is an annual, cutting before seeds are mature settles the matter; but all roots must be cut, as a single root uncut enables its plant to mature many seeds. For this reason, fields plowed to kill this pest must be watched and all plants retaining vitality must be lifted and their root connections broken.

Along river washes where drifting plants are caught by weed or brush thickets, the plants can not blow about and almost invariably increase in such places is small.

Under our eradication law, much has been accomplished as a result of the campaign of education that had to be initiated, and this has awakened a very general knowledge of many weeds as well as of Russian thistle. There has developed a very strong appreciation of the duties of citizenship in relation to clean fields and clean roads. Large areas have been cleared of minor infestation, and are kept clear despite land and sea breezes, the sandblow, and the river wash. However, the human factor needs further training.

As in many other undertakings, cooperation is the watchword of success, so in our Russian thistle campaign there must be no let-up at county lines. Adjacent counties must deal justly by each other; stream basins must be cleared at their heads; large estate holders must realize that their greater measure of protection calls in justice for a greater measure of responsibility to overcome the pest, and even the small holder must "do his bit" intelligently and fairly. State agencies should cooperate. Its representatives related to agriculture, including farm extension workers, farm advisers, agricultural teachers in high schools, and all rural teachers should assist in spreading recognition of weed pests as well as need and methods of control.

THE CHERRY INDUSTRY OF NAPA COUNTY.

By W. D. BUTLER, County Horticultural Commissioner, Napa, Cal.

The writer, while having grown up in the cherry industry, approaches the subject with many misgivings as to any authoritative information he can give. Identical factors during different years have caused such varied results that all our old cut and dried rules seem to be chaotic.

Napa County was among the first of the localities of the state to have any cherry plantings. Early settlers planted quite extensively for their day in the vicinity of Napa, but later moved to the Vaca Valley, on learning that cherries ripened earlier there. It is true that the very earliest cherries bring the best prices but of late years the tide seems to be turning in favor of the large, firm, good shipping, late varieties. This condition has been a large factor in causing quite extensive planting of which nearly all are of the late shipping varieties and, of course, the old canning stand-by, the "Royal Anne." The logic of this is that the central California and the foothill districts are out of the way and the bay counties have the market to themselves with very superior cherries to ship. Also it is possible then to load mixed cars consisting of apricots, plums, peaches and cherries, under which conditions no market is called upon to take one entire car of any one kind of fruit, resulting in better prices. So, not being able to catch the "bull by the horns," we have "him by the tail." "We get there," though a little late.

All varieties do well in this county. The poorest is the Centennial, which cracks badly because of coast influences. The hardiest and most prolific is probably the Black Republican. The Tartarian and kindred varieties do well but the king of them all for profit is the Bing. The Lambert is possibly a finer cherry as to size, but so far has been a shy bearer. It might do better as the tree gets older. It is too new a variety to absolutely condemn. As for the Royal Anne, it does not do better anywhere. The tree is thrifty and bears well and always stands in good favor with canners as to quality. A person who understands the game can also ship them for profit, usually in excess of canning prices.

Cherry trees, as is well known, are of extreme long life. The oldest trees in the county are still thrifty and bear well. The only disease we have to contend with is "die-back." The cause does not seem to be well known. By keeping all deadwood removed the tree keeps sending out new wood. Trees that are over forty years old have as nice tops as ever. Because of enthusiasm over large returns, there have been numerous plantings of late on ground unsuited for cherries. Only land that is light in physical character, rich in fertility and well drained should be used. Sour sap and dying will surely come in the early years of the tree's life on heavy soil. Napa County is virtually free from other cherry diseases and pests. The thrips are not bad and seem to do very little damage. Occasionally a young shoot will become infected with black aphis but it does not spread. A cherry orchard is the nicest and easiest of orchards to care for. It requires little pruning and usually no spraying. Soil beneath cherry trees cultivates easily because of the shade which keeps the soil from sun baking. The heavy foliage dropping each year and being incorporated with the soil tends to looseness and ease in keeping a mulch.

Several growers in this vicinity have been doing some experimenting in regard to growing the tree. It has been held that a cherry tree need not be pruned while growing. It has been well demonstrated that a rounder, more bushy and lower tree can be developed by a judicious use of the shears. Another thing has been tried and found successful and that is to top old trees that have become too high. They respond very well and will in two years form nice new fruiting tops. The writer would also recommend the use of Mazzard seedling stock planted direct in the orchard and then budded or grafted in the first year's growth several inches from the main trunk. This leaves the trunk and main crotches of the wild stock which is more hardy and resistant to adverse conditions. This wild stock will seldom sour sap, and when that occurs it is generally in the main trunk or the crotches. Also it is not nearly so subject to sunburn and borer attacks, and if struck by a cultivating instrument and "barked" it will heal over more quickly. No time will be lost for it is the root system that makes the tree, nor will it cost more, for seedling trees are 30 or 40 per cent cheaper and budding can be done for 4 or 5 cents per tree.

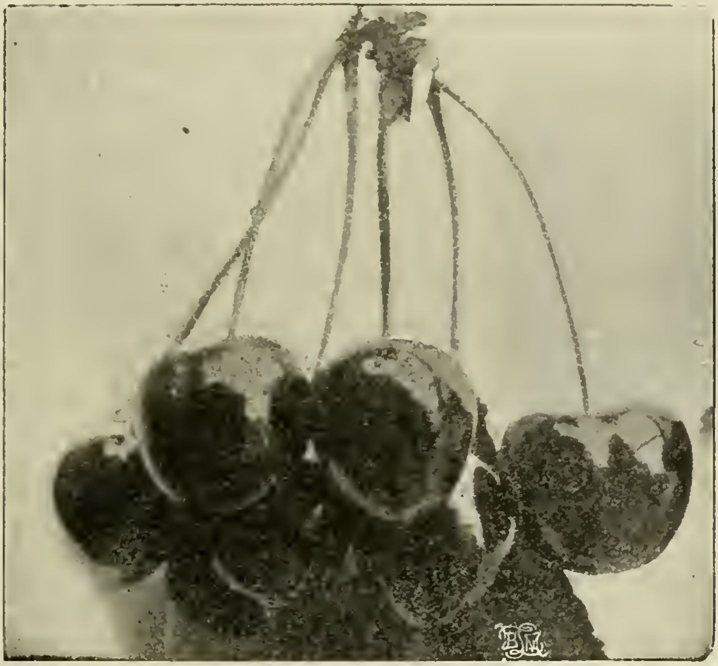

FIG. 138. Cluster of Black Tartarian cherries. (State Comm. of Hort.)

As to climate Napa County is well favored for the growth of the cherry. We seldom have burning hot weather, strong winds, or too foggy weather. I think it is perfectly safe to claim that with proper soil, planting and care a Napa County cherry orchard is as safe and profitable horticultural venture as may be found in the state.

SEED INSPECTION IN NEVADA COUNTY.

By D. F. Norton, County Horticultural Commissioner, Grass Valley, Cal.

Of the many duties of the county horticultural commissioner, in my opinion the inspection of field seeds ranks next in importance to that of nursery stock. Under the old horticultural law in effect prior to 1917 the inspection of seeds was not made a part of the work of the horticultural commissioner. A few counties of the state, however, provided for seed inspection by ordinance. The supervisors of Nevada County, recognizing the importance of clean seed for the farmers, passed an ordinance making it the duty of the horticultural commissioner to inspect all hay, grain, potatoes and seed coming into the county. Before the passage of that ordinance, alfalfa was being imported, many carloads of which would contain 25 per cent Russian thistle. These were promptly rejected and sent out of the county and within two months we were getting clean hay. The same holds true with potatoes and field seeds. Shipment after shipment was ordered out of the county until shippers learned that Nevada County was not a dumping ground for junk.

When condemning seed as a matter of protection it is always best to send a sample to the Agricultural College, Berkeley, a second to some other place where it can be tested, and a third should be kept until all danger of a law suit is over. This method of procedure has saved me many times, for I have been threatened with three damage suits at once, none of which materialized. Horticultural commissioners who have not made a practice of inspecting seeds will be surprised at the amount of adulteration, especially in the grass seeds, of which red top, rye grass, blue grass and lawn grass are the worst. White clover is generally mixed with sorrel and black seeded plantain. Alsike clover usually contains from ten to fifteen varieties of weed seeds, sorrel predominating. Red clover is almost invariably mixed with black seeded plantain. Sweet clover generally passes inspection; the adulterterants to be looked for are lambs quarter, green foxtail and *Amaranthus* sp. Sometimes we will find dodder or Russian thistle and in this case we reject shipment. It may be interesting to read some of the reports received from the Bureau of Plant Industry on samples of seed that have been condemned in this county. Here is a report on a sample each of alsike clover, white clover, vetch and red top:

	No.-seeds per pound.			Per cent
	Alsike clover	white clover	Vetch	Rep top*
Weed seed				
Sorrel	12,375	40,050	------	------
May weed	9,000	------	------	------
Buckthorn	2.475	4,500	------	------
Velvet grass	2,475	------	------	------
Wild clover	675	------	------	------
Curled dock	450	------	------	------
Allocarya sp.	450	------	------	------
Low hop clover	225	------	------	------
Epilobium sp.	225	------	------	------
Rat tail fescue	225	------	------	------
Starwort	------	6,075	------	------
Alyssum sp.	------	1.125	------	------
Viola sp.	------	675	------	------
Heal-all	------	450	------	------
Yellow trefoil	------	450	------	------
Chickweed	------	225	------	------
Small flowered crane bill	------	225	------	------
French weed	------	225	------	------
Red pimpernel	------	225	------	------
Cruciferæ	------	225	------	------
Corncockle	------	------	4.140	------

Charlock	------	------	270	------
Black bindweed	------	------	120	------
Cleavers	------	------	90	------
Cow cockle	------	------	75	------
Morning-glory	------	------	60	------
Yellow foxtail	------	------	15	------
Blue weed	------	------	15	------
Corn gromwell	------	------	15	------
Wild vetch	------	------	15	------
Immature timothy	------	------	------	8.50%
Chaff	------	------	------	77.00%
Total weed seeds	28,575	54,450	4,835	85.50%

	No.-seeds per pound.			Per cent
	Alsike clover	White clover	Vetch	Red top
Other seeds				
White clover	9,450	------	------	------
Red clover	2,925	2,700	------	------
Berseem	225	------	------	------
Rye grass	225	------	------	------
Alsike	------	9,225	------	------
Timothy	------	450	------	------
Agrostis sp.	------	225	------	------
Vicia sp.	------	------	4,500	------
Spring vetch	------	------	4,485	------
Total other seeds	12,825	12,600	8,985	------
Per cent of pure seed	83.85	91	72	14.50

*This red top seed was quoted at 30 cents per pound.

These four reports out of a great many will show the importance of seed inspection. Alfalfa generally contains from two to ten per cent immature seed. Russian thistle may be looked for in that from Oklahoma.

As the new horticultural law makes it a part of the duties of the horticultural commissioner to inspect seeds, I would advise writing to the Bureau of Plant Industry, Washington, D. C., for the tray of 100 vials of weed seeds. Then with a common dissecting microscope a determination can be made that will always put one on the safe side; but to make assurance doubly sure a sample should be sent to the seed laboratory at Berkeley or elsewhere.

THE LOQUAT IN ORANGE COUNTY.

By Roy K. Bishop, County Horticultural Commissioner, Santa Ana, Cal.

The loquat has been grown in Orange County over forty years which really marks the beginning of irrigation and tree planting.

At first these trees were only planted in the family orchard and for ornamental purposes. They were all seedlings but many of them proved to be heavy bearers of good quality fruit though generally small and uneven in time of ripening. The first orchard of commercial planting was made by Mr. C. P. Taft near Orange in 1891. Mr. Taft had by selection obtained some very promising varieties, such as the Advance, Champagne, Early Red and Premier. Another variety of value is the Thales which was produced at Placentia.

Following Mr. Taft's planting there were several acres of loquats planted much of which were interset with either Valencia oranges or lemons. Most of these trees are now taken out to make room for the citrus trees.

As the loquat blossoms in October and November carrying its tender fruit through the winter months it necessarily requires a location where frost is very slight. Therefore commercial loquat-growing is confined to the foothill sections at Villa Park, Olive and El Modena.

As to soil this tree is not very exacting, doing well on sandy soil and through all grades to black adobe. It requires less water than citrus fruits so could be grown where the summer water supply is limited. It also requires less cultivation than the citrus and less pruning. As the tree is practically free from insect pests the expense of fumigation and spraying is eliminated. There are no serious diseases that attack the loquat. Pear blight occasionally kills a limb but seldom destroys a tree.

To get the best grade of fruit thinning of the clusters is practiced. This work is usually done after danger of frost is past.

The markets for the fruit are Los Angeles and the coast cities; but the fruit could be shipped to Eastern markets as has been proven by experimental shipments. By the building of distant markets the industry could be very profitably extended.

The better varieties are very delicious fruits to eat out of hand, for the making of pies and for jelly. The loquat comes into the market in early spring when there is practically no other fresh fruit. The first fruits ripening by March 1 and continuing to ripen until June. It should be found in every family orchard along with the peach and plum.

The tree being an evergreen, with large, beautiful leaves, is very fine for ornamental purposes and therefore could be used as a street tree.

The people that are growing loquats for the market consider this crop the equal of other fruit crops. One orchard in El Modena consisting of one hundred trees, interset with lemons of like number, has averaged the grower $7 per tree for the past five years, which is more than the lemons have averaged. Another orchard of ten acres has given an average yield for the past ten years of more than $400 per acre.

Anyone interested in the culture of the loquat can find very useful information in Bulletin No. 250, by Ira J. Condit, of the Agricultural Experiment Station, Berkeley, California.

THE SHIPPING PEACHES OF PLACER COUNTY.

By C. K. Turner, County Horticultural Commissioner, Auburn, Cal.

The shipping season for peaches in Placer County covers a period of five months, from May to September, with a few of late varieties still going forward throughout October. The district in which this fruit is grown on a commercial scale is confined to a belt, approximately 15 miles long, on both sides of the Southern Pacific Railroad main lines, from Loomis to Bowman, embracing an area of about 100 square miles in the rolling foothills of the Sierra Nevada Mountains. In the territory covered by this belt there is a wide difference in the character of the soil, varying from the decomposed granite at the lower or southwestern end of the belt, through the slate formation around Auburn to a red clay loam at the upper northeastern end. At Loomis we are approximately 200 feet above sea level, while at Bowman the elevation is some 1,400 feet. While, as just stated, peaches are grown on a commercial scale throughout this district, yet an overwhelming majority of this fruit is raised on the granite soils of the south and western end of the belt. Last year (1916) approximately 97 per cent of all shipping peaches were raised in the territory tributary to Loomis, Penryn and Newcastle, this being, roughly speaking about 50 per cent of the area described, and there seems no doubt that, of all our soils, the decomposed granite is that which best meets the requirements of the peach.

In Placer County there are some 5,475 acres of shipping peaches in bearing, representing about 591,300 trees, ranging from four-year-old trees to fully matured trees. These, with a crop that was estimated at 75 per cent of normal, gave last year (1916) 1,301,548 boxes, or about 1,126 cars, that were shipped to market. Figures are not available showing the average age of the trees, so that the figures just given may be somewhat misleading as to the bearing capacity of the trees. However, it may be stated that mature, vigorous trees will average from six to eight boxes to a tree, while four-year-old trees will give from one-half to one box.

The varieties grown embrace practically all the commercial varieties, from the early white peaches in the latter part of May to the Salways and other late yellow peaches which go to market up to the middle of October in a normal season. In the order of their numerical importance the Elberta is supreme, many solid cars of this variety being shipped in midsummer. There is a large acreage in Triumphs, the earliest of our yellow peaches. Following these are Hale's Early, St. John, Crawford, Elberta, Lovell, Salway and other freestones. Practically all our midsummer clings, Tuscan, Orange, McKevitt and others are wrapped and shipped to Eastern markets, and a considerable portion of the later clings, Phillips, Levi, etc., are also marketed in the same manner.

Thanks to modern methods of spraying and caring for the trees there is now a very small proportion of the peach crop lost through the attacks of insect pests and diseases. Prior to 1902 the peach growers of Placer County annually lost a considerable percentage of their crops (in some cases the loss amounted to 50 per cent or even higher) through the ravages of the larvæ of the peach twig borer *Anarsia lineatella.* This pest, however, is now under absolute control through the use of lime-sulfur spray in the spring, at the time the blossom buds are swelling, and the loss is only a small fraction of 1 per cent in orchards properly cared for. For a few years, about 1904 to 1906, our trees suffered considerably from the attacks of the disease commonly called "peach blight," caused by a parasitic fungus (*Coryneum beyerinkii*), but this has been brought under complete control by means of a late fall spray of Bordeaux mixture. Another fungus, peach leaf curl (*Exoascus deformans*) which, if uncontrolled, would be very damaging to the trees, is no longer much to be feared since it is practically eradicated by the same spray that controls the twig borer.

CROP STATISTICAL WORK IN RIVERSIDE COUNTY.

By Daniel D. Sharp, County Horticultural Commissioner, Riverside, Cal.

Upon becoming horticultural commissioner of Riverside County it was found that there was limited data on file to which I could refer for guidance in forming estimates for the reason that very little data on crops had been required from the county commissioners up to that time. The demand for this information is increasing daily as the real value to the farmer is more fully appreciated, and it is now necessary to have systematized records which can readily be referred to, and to keep them on file year after year for future reference.

The first year the horticultural inspectors in the different districts were called upon for reports on acreages of the various crops grown, it was realized that there was a very hazy idea of what was needed, as no two inspectors reported in a similar way. Immediately it was decided that regular blank forms were necessary for reports, consequently a regular form was printed, with the listed crops down the left side and five columns across the top; the first column for the bearing acreage, the second for the nonbearing acreage, the third for the current season's planting, the fourth for the addition of the other three columns forming the total acreage, and the fifth column for the yield. The column for this year's planting was for the purpose of keeping track of the various horticultural crops being planted in the different districts. These reports signed by the district inspector furnished a ready reference of what was planted and produced in each district, and simplified the totaling for the county as a whole, which was done on a similar blank.

A large chart was prepared, representing the thirteen districts in the county listed along the top, and the crops reported upon listed down the left side, and the bearing acreage of each crop listed under all districts producing it, as well as the percentage of the total county bearing acreage of each crop in each district. Thus from the report can be quickly seen the proportion of the county total that each man's district report represents.

A system such as described is very important. Without it, reports received are often misleading. The same system should be followed whether the commissioner has inspectors or not. If he has no inspectors he should have his county divided into districts according to the factors that might cause a difference in yield, such as irrigated and nonirrigated areas, and such areas that might be affected differently by climatic conditions. The commissioner could then note conditions for the various districts and keep a similar office record.

The value to the farmers of these crop reports must not be overlooked. Through them they are enabled to know conditions throughout their own and other counties of the state. False and misleading reports by speculators have been circulated freely in the past, and such reports can only be prevented by the compilation of accurate reports by men whose interest is only in giving the facts. As commissioners we should make every effort to have these reports as correct and as comprehensive as possible, and in such form as to be readily available.

PEARS.

By Howard G. Kercheval, County Horticultural Commissioner, Sacramento, Cal.

Sacramento County ranks first in the production of pears in the state of California, there being over 5,000 acres planted mostly in the delta regions of the Sacramento and American river districts. While a great bulk of these pears, which are mainly Bartletts, are shipped to the large eastern markets, there are still a great quantity that are handled by local and outside canneries, there being three large canneries in the city of Sacramento, while more than 150 carloads are shipped to other canneries in the state.

For the past several years the prices obtained from the canneries have been fairly satisfactory, ranging from $30 to $45 per ton. However, with the increase in production, it has become necessary for the growers to form themselves in an organization known as "The California Pear Growers Association." It is hoped as a result of this movement that much better prices can be obtained by pooling the crop as well as greater efficiency in spraying, better cultural methods and more careful harvesting. The price obtained should be commensurate with the continual increased cost of production.

During the past season a great many tons of pears were wasted on account of a lack of labor to handle the crop, and it has been suggested, in addition to the canning activities, that several drying plants be established adjacent to the large pear areas. This would result in the saving of considerable fruit that can not be harvested in time for either Eastern shipment or the canneries. This would also afford an opportunity for the use of schoolboy labor, which has not as yet proven to be quite satisfactory in this industry.

OBSERVATIONS ON PRUNING YOUNG APRICOT TREES IN SAN BENITO COUNTY.

By Leonard H. Day, County Horticultural Commissioner, Hollister, Cal.

The ideal tree which most apricot growers here have in mind is a tree branching near the ground and spreading gradually with a more or less open center, filled in by some branches higher up from the ground, the tree being held in to a height of twelve to fourteen feet by heavy annual cutting back as soon as it reaches mature size. This ideal form has no doubt arisen from the necessities of climate and economy in picking fruit. The more or less open center seems to be necessary to admit light enough to mature a proper amount of stocky fruit wood, spurs and buds, and to sweeten the fruit. Of more recent years the brown rot disease (*Sclerotinia fructigena*) has become quite prevalent. This fungus attacks more readily the less sweet, slow-maturing, shaded fruits.

Perhaps the greatest diversity of pruning practice has been in regard to (1) amount of top removed each year, (2) number of main branches retained, (3) summer pruning, and (4) attention to developing strong, fruit-bearing laterals and spurs. In regard to the amount of top removed each winter a very prevalent idea has been that heavy cutting back must be done to develop stocky main branches, the contention being that "long pruning" would develop slender main branches and trunk, and encourage such heavy bearing as to exhaust the inherent strength of the tree while it is young. The fruit spurs, it was thought, would be weakly in the lower parts of the tree and the fruit-bearing be largely relegated, within a few years, to the outer and upper parts of the tree. Many have taken this heavy cutting idea too seriously and cut back the young trees so short as to dwarf the growth temporarily and postpone the bearing a year or so. Trees cut too short run wildly to wood—lower growths which otherwise would have been fruiting laterals become large "suckers."

In direct contrast to this practice several growers have not topped their trees except when they were planted. One of these orchards is over twenty years old, and has been a very profitable orchard. The trees bear plenty of fruit in the lower parts as well as the tops, but they are very high, so that picking is relatively expensive. This same grower has 700 trees planted and topped in the spring of 1912. These have not been topped since but thinned out to a few main branches. This summer, during its fifth season's growth, it produced four 40-pound boxes of apricots per tree. Thinning of fruit was necessary in the spring, and all forming fruits knocked off the ends of the long unpruned branches to prevent breakage. The trunks and main branches of these trees are very large in girth measure for trees of this age. He does not summer prune.

Another orchardist headed the trees low in the spring of 1911, and thereafter thinned to a few main branches and merely removed the slender tops of these trees each winter—possibly one-fifth or one-fourth of the previous summer's growth. No summer "suckering" was practiced. He also materially increases the fruit-bearing capacity of the trees by retaining and encouraging many horizontal branches which grow outward just above the height of a man's head. A lateral growth, suckerous or otherwise, is selected and pruned back each winter to two feet or so until a fruiting branch five or six feet, or more, long and an inch or so in diameter is developed. I have observed in many orchards that branches of this sort, more or less horizontal, are very heavy bearers. Another practice carried out in this orchard is a similar treatment of smaller growths throughout the tree to encourage stocky, fruiting branches beset with fruit spurs and buds. This method consistently followed should retain indefinitely a large fruiting area in the lower parts of these trees, as I have observed in some older orchards thus treated. Smaller spurs may succumb, but these will persist. Even suckerous growths can in this manner be converted into fruit-bearing branches if necessary. The above orchard began bearing bountifully during the fourth season's growth. The trunk and main branches of these trees are greater in girth measure than other trees of the same age in this district. The height and spread of branches is also unsurpassed.

Another grower has adopted a long-pruning method, but in this case too many main branches were retained and rigorous summer pruning practiced, with the result that the main branches are relatively slender and the interior of the tree too much shaded.

Summer pruning to remove the suckerous growths in the lower parts of the tree some consider essential, others do not. My observations and experiments lead me to believe that trees trained under the summer pruning regime are not as stocky at bearing age as those not so treated. In my experiments trees not given this early summer pruning showed, in the following autumn, greater diameter of trunk and main branches, but shorter growth than did the trees not so pruned. This reduction of foliage by early summer pruning also prevents the root from growing to its utmost, so that the tree has less root to push growth with the following spring, while soil and climatic conditions are most favorable to growth. In the nursery row I have seen a striking difference in size of root system between trees summer pruned and those not so pruned, and also between roots grafted to slow-growing tops, such as the prune, and those grafted to rank-growing tops, such as the apricot. In my judgment a late summer suckering about the time the moisture supply is becoming short—when the terminal growth is stopping and terminal buds forming—would usually be the more reasonable procedure. Even those occasional immense "suckers" probably add so much to the sap-carrying capacity of the branch it is "robbing" as to justify its retention until late summer.

In conclusion, the writer would suggest to growers in San Benito County a longer pruning system in developing young apricot orchards than has usually been practiced, coupled with a studious attention to detail of securing the usual ideal shape with center not filled in so dense, and the development of stocky fruiting wood throughout the lower parts of the tree. The early returns secured by this method should be especially helpful to the beginner who is working on limited capital.

SPRAYING AS A MEANS OF CONTROLLING BLACK SCALE ON CITRUS TREES.

By JOHN P. COY, County Horticultural Commissioner, San Bernardino, Cal.

Since fumigation was put on a commercial basis, spraying, as used for the control of scale insects on citrus trees, has been practically discontinued. True, there have been several times when spraying has had a new lease of life for a short time and in some districts quite a number of growers would spray, but these spray spasms have always been followed by a return to fumigation. At times a batch of spray men appear on the scene with new sprays or the same old sprays under new names, one of their stock arguments being something like this: "Much cheaper than fumigation; much more effective and no damage." It is reported on good authority that there is a "sucker" born every minute. I don't know that the count is exactly accurate, but I do know that last year many growers "bit," and I also know that there are very few of those who tried spraying last year that are going to try it again this year.

There are certain reasons why spraying is not a satisfactory method to employ when trying to rid cirtus trees of scale insects. The foliage of citrus trees is usually dense and remains on the trees throughout the year, while the scale scatters over the twigs and leaves. If it is a bad infestation of black scale there may be hardly a leaf on the tree that has not some young scale on one or both sides of it. Under such conditions in order to do satisfactory work with a contact spray it is necessary that every leaf on the tree be thoroughly wet on both sides. This seems to be an impossibility when doing work on a commercial scale. Be the spray ever so good, there are always patches on the trees where live scale can be found due to those places being missed. Then again citrus trees not becoming dormant to the same extent as deciduous trees there is no time when a dormant strength spray can be used on them.

During the fall of 1916, owing to the shortage of cyanide, about 5,000 acres of citrus trees were sprayed in San Bernardino County. About a dozen different sprays were used and it gave us a splendid opportunity to compare the results. One of the striking features of the investigation was that none of the sprays gave uniform results. Perhaps there would be a 90 per cent killing in one grove and another grove treated with the same material would show only a 40 per cent killing. This difference may have been due to the denser foliage in one grove or to less careful work; perhaps temperature and moisture conditions had something to do with it also. It seems to be almost impossible to keep the man who holds the nozzle keyed up to a pitch where he will do careful work all the time.

Another feature of some of these sprays was the very severe damage they would frequently cause. This damage consisted in dropping leaves, burning fruit, dropping fruit, and sometimes killing the twigs and smaller branches until the trees would look as though a fire had gone through them. One of the sprays did little apparent damage at the time of spraying except to leave slight discolored spots on the fruit. We called the growers' attention to these spots, but the spray agent said they would wash off with the rain and do no damage. When this fruit was packed it was culled heavily on account of these spots.

In one grove that I visited about three weeks after it had been treated with a certain spray, I found that two-thirds of the leaves were on the ground and all the way from a few up to 350 oranges under each tree. Of course this was a very extreme case, but it shows what may happen with some sprays. This happened to be one of the sprays that the agent claimed could be used for half the cost of fumigation, with 50 per cent more efficiency and no injury. In another case which shows the treachery of some sprays, a company recommended that a man use a spray that had been used on another grove a short time before with no apparent damage. The man used the spray and received such severe injury that he brought suit and got judgment for $1,000 damages.

Our investigations led us to believe that sprays containing arsenic were apt to cause severe burning of fruit, dropping of leaves, and dead wood. Miscible oils were apt to cause defoliation and spotting or dropping of fruit. Sprays containing sulfur frequently burned the fruit if applied when the temperature was very high. Some sprays in which there was much soap seemed to bleach or yellow the trees and sometimes burned the fruit. Kerosene and distillate, when properly emulsified, did little visible damage, and where carefully applied controlled the scale as well as any other spray and better than many. All sprays when strong enough to kill scale do more or less injury to citrus trees; spraying is not as efficient as fumigation; it is not cheaper because it must be done oftener and it causes more damage.

A number of sprays have been put on the market with the claim that they have been thoroughly tested out and found to be almost perfect scale insecticides and that they would cause no injury. These same sprays have caused some injury in many of the groves in which they have been used and in some cases the injury has been very severe. Often the formula has to be changed, which proves that the spray was not thoroughly tested before it was put on the market. My advice generally to a man who feels inclined to spray is, not to spray his whole grove with some spray that he is not familiar with, but if he wants to try it to spray a few trees and wait for results before using it on the rest of the grove. Even then under different conditions he may get different results.

There are certain conditions where I advise spraying. Very young trees are apt to be broken by tents and on account of being small may be thoroughly sprayed with some reliable insecticide with good results. Sometimes trees are so situated near houses or fences that it is impossible to put tents over them. In such cases spraying is permissible. Again, in the case of very large trees, it is sometimes advisable to keep the scale in check by spraying. But for general orchard work fumigation is no more expensive in the long run and is much more satisfactory.

PARCEL POST HORTICULTURAL MATERIAL DANGERS.

By H. M. Armitage, County Horticultural Commissioner, San Diego, Cal.

With the inauguration, January 1, 1913, of a parcel post system, allowing eleven pounds to be carried through the mails, a loophole in the efficient horticultural quarantine service of California was opened to the introduction of serious pests of orchard, field and garden through the medium of parcels of horticultural and agricultural material, delivered within the state without proper inspection.

The danger to the horticultural and agricultural interests of the state from such shipments had been realized from the time of the suggestion of such a system, and long before it became established the state office had been conferring with the proper federal officials in an effort to arrange for the holding of such parcels for inspection at the point of destination. Definite action on the part of the postal authorities was slow in coming and it was not until April, 1915, that a definite order was issued at Washington providing for terminal inspection in those states maintaining an inspection service, of all parcels passing through the mails containing horticultural material.

At the time that this order was issued a load was removed from the shoulders of those responsible for the horticultural protection of the state, as it was felt that, at last, the loophole was effectively closed. But was it? I believe that you who know will agree with me when I say that this load has gradually returned as the interpretation and application of this order on the part of the postmasters has been observed during the two years that it has been in operation. Uneasiness was expressed by the state office in a request to the county horticultural commissioners to report on the operation of this order in their respective counties. It was in the compilation of such a report for the county of San Diego that I was brought to realize the ineffectiveness of the present system and the dangers attendant thereto.

In considering the dangers from parcel post horticultural material a determination of the importance of the mails as a carrier of shipments requiring horticultural inspection as related to other carriers, is essential. For the purposes of this article I am using the inspection records of San Diego County, covering a fiscal year, May, 1916–May, 1917. Of 2,578 shipments inspected during that period, 771, or 30 per cent, arrived via parcel post. In comparison, the express carried 43 per cent, freight 23 per cent, and other carriers 4 per cent. Taken into consideration with the fact that from reliable information at hand it was conservatively estimated that only 50 per cent of the shipments passing through the mails, requiring inspection, were being intercepted, the importance of the parcel post is apparent.

While the inspection of intercounty shipments is absolutely necessary, its strongest point is the prevention of the more rapid distribution of those pests already established within the state over an area in which there is often a strong possibility of natural spread. In the case of interstate shipments, however, careful inspection can prevent the introduction into the state of new and serious insect and plant disease pests, of which there is practically no possibility of introduction through natural spread. Therefore it is apparent that the inspection of interstate shipments is of more importance than that of intercounty shipments. The importance of the parcel post is further shown when considered in relation to this phase of the question. Of the 2,578 shipments inspected during the period previously stated, 622 originated outside of the state, of which number 342, or 55 per cent, arrived via parcel post. While these figures were taken from one county I believe that they could be proven to be typical of most of the counties of the state.

With 25 per cent of the total shipments and 50 per cent of the interstate shipments of horticultural material requiring inspection arriving via parcel post, the care with which the postmaster, the man charged with the safe and proper delivery of such parcels, observes the provisions of the order providing for their inspection, merits a great deal of attention. Here lies the very fault of the system. The law has thrown the responsibility of carrying out its provisions on the very person least able to bear the same, meaning the country postmaster. The postoffice is a side issue with him. He is so busy measuring off calico or drawing kerosene that he does not have time to read the postal guide, or if he does, apparently does not attempt to remember the numerous and complicated regulations therein. As long as the mail gets to the proper address he feels that he has faithfully fulfilled his duties. This does not hold true with regard to inspection centers and other offices of such size that the postmaster has no outside business and devotes his full time to postal work. He is familiar with all of the regulations and he feels responsibility in seeing that they are properly carried out. The attention of postmasters to the order requiring them to return parcels of horticultural material to the nearest inspection center for inspection, in San Diego County, may be briefly expressed in the following statistics covering the same period used before. During this period of twelve months the 25 per cent of total shipments and 50 per cent of interstate shipments, inspected, were returned from only 23 per cent of the postoffices in the county. In other words 77 per cent of the offices were either receiving no parcels requiring inspection or were disregarding the regulations. You suggest the former as being the more probable and that this 77 per cent constitutes the smaller offices of the county. Outside of the inspection centers the largest number of parcels returned for inspection came from one of the smallest offices in the county. Among this 77 per cent an office having a tributary population of 3,500 reported not one parcel received during the month of April, 1917, requiring inspection, while an adjoining office with a tributary population of 1,500 returned 24 parcels for inspection during the same period. During this same month there were traced to addresses 23 shipments which had been delivered through 14 offices without being returned for inspection. Unfortunately for this article, though fortunately for the state, no pests were intercepted on these shipments, but as our source of information concerning such shipments included only a small per cent of the parcels passing through an inspection center, the possibilities of a one-hundred per cent bill of health were very small. Each of the negligent offices was notified following the first violation, following which, one office repeated the offense three times and one, twice. Considering this it can hardly be said that the postmasters are giving the order the attention which it must have if it is to be considered efficient.

That horticultural material passing through the mails requires inspection may be shown by the following interceptions occurring during the twelve month period used. Citrus white fly, twice; plants in full foliage from white-fly states. four times; pines from the browntail moth area and without proper inspection at the originating point, once; peach stock from the peach yellows area, once; crown gall, three times; mealybug, five times; narcissus bulb fly, once; nematode root knot, four times; and such other pests as hemispherical, aspidistra soft-brown and other scale insects, red spider, thrips, hairy root, etc.

The present system of handling the inspection, particularly in the country postoffices, which, as before stated, are in the majority, where the postmaster knows everyone and everyone knows the postmaster, is against human nature. Jones lives up in the mountains among the pines. He orders a small lot of gooseberry plants, and perhaps a chestnut tree, from an eastern nursery, to be delivered to him via parcel post. He knows nothing about the danger of introducing white pine blister rust or chestnut blight from such an area. He is sure that his plants will arrive at his nearest office on a certain day. He drives in and finds them there, but learns that they must be returned sixty miles to the nearest inspection center, through which they have just passed, for inspection. He must put up half the price of the plants to pay the postage for the trip down and back. The plants have already been on the road ten days and the package feels dry. He can't spare the time from his spring work to make a second trip in for the plants. The postmaster and the addressee, neither being aware of the danger from admitting such plants without proper inspection, and being old friends, get together on the matter with the result that they cut out the what they term "unnecessary red tape" and Jones goes on his way rejoicing with the plants under his arm. Nobody is the wiser until years later when an investigation is started to determine just how the white pine blister rust and the chestnut blight were introduced and became established, doing thousands of dollars injury to the horticultural and agricultural interests of that section as well as offering a source of natural spread of these serious pests on the Pacific Coast. With the proper authority this package could have been held in transit at the inspection center through which it passed, with very little delay and no added expense to the addressee or labor to the postmaster, and the state would have received full protection.

If the order in effect at the present time were designed to discourage the shipment of plants by mail, and that is the way it should work out, theoretically, it has failed in its purpose and has resulted, instead, in a feeling that the injustice of requiring one to return plants to an office through which they have just passed, for inspection, is only a matter of "official red tape." There are no serious consequences for the postmaster found violating the same and he stands in better with his constituents if he delivers perishable matter without delay.

One should not criticise without offering a solution of the matter. I believe that there is not a county in the state in which over 90 per cent of the parcels passing through the mails, containing horticultural material, do not pass through the very inspection center to which they would be returned for inspection, and the small remaining per cent could easily be so routed as to do the same. Where there is a sufficient quantity, some of these parcels pass through the center in closed sacks, but with the proper regulations they could be thrown to sacks destined to be opened at the inspection center and, following inspection, could be forwarded to the office of the addressee with, as previously stated, a minimum of delay and no additional expense to anyone concerned. Also, as previously stated, the inspection centers are of such size that the postmaster in charge has no outside business and devotes his full time to the postal work. He is familiar with all of the regulations and feels his responsibility in seeing that they are properly carried out. He is the logical person to be responsible for the holding of parcels for inspection, and if the system could be so arranged that every parcel of plants or plant products, requiring inspection, consigned to his or tributary offices, could be routed direct to or by way of his office and held there, to be forwarded following inspection, I believe that the danger from the parcel post system would be minimized and the state would receive the fullest protection that inspection can give.

With gipsy moth and browntail moth costing the state of Massachusetts $500,000 annually for their control and not considering the damage caused by these pests to the forest and shade trees of that state; with citrus canker costing the state of Florida

$36,000 a month and a total destruction to date of over 100,000 bearing citrus trees and over 3,000,000 citrus nursery trees in an effort to eradicate this serious citrus disease; with white pine blister rust established in the Northeastern States and threatening the destruction of timber in this country, valued at over $400,000,000; with cotton boll weevil threatening the life of the cotton industry of the country; with citrus white fly costing the growers of the southern states thousands of dollars annually for control alone; with none of the pests mentioned yet established within the state, and they do not include, by far, all that are knocking for admittance; with those scale pests of the citrus already introduced and established within the state costing the growers over a million dollars annually, for fumigation alone; with 50 per cent of the interstate shipments of horticultural material being carried by the mails and with less than 25 per cent of the post offices carrying out the complicated regulations provided for placing such parcels where they may be inspected—are there, under the present system, *any* parcel post horticultural material dangers?

FRUIT INSPECTION IN THE SAN FRANCISCO MARKETS.

By **Dudley Moulton**, County Horticultural Commissioner, San Francisco, Cal.

The improved markets for fruit and vegetables since the passage of the fruit standardization laws have benefited San Francisco perhaps more than any other one place in California. It has been common practice of fruit growers heretofore to consign their second-grade fruits to this local market. We were never able under the old laws to properly correct this condition, but recently it has been a simple matter. We have adopted a general plan of requesting merchants when they receive shipments, which are of inferior quality or not properly packed or marked, that they write to the shippers notifying them that unless their products arrive in the San Francisco markets in compliance with the new laws, that they will be confiscated or returned. In this way we have been using the power of persuasion and have obtained a hearty cooperation of merchants. However, we have returned many lots to the shippers and have sent others to the garbage collector, when the shippers have persisted in ignoring our requests. Anyone passing through our San Francisco markets now can see a very marked improvement in the quality of products offered for sale.

The merchants of San Francisco distribute their goods to all parts of the world. Almost every outbound ship carries in its cargo oranges, lemons, apples, potatoes and onions; these are shipped in large quantities to Australia, New Zealand, Hawaiian Islands and other parts. Most of these shipments must be certified that they are free and clean of insect pests and plant diseases. All will readily appreciate that an improvement in the grades of fruits received in San Francisco will raise the standard of products which are shipped out. Merchants in foreign markets will recognize the quality of California grown products which will mean more than anything else to help build up our foreign trade.

The Colombo market is strictly a local organization composed of Italian gardeners who bring their vegetables from near-by districts. The vegetables here are for most part clean and fresh, but the general improvement of all grades and the enforcement of fruit standardization laws has had a marked effect on this strictly local trade. San Francisco residents are now able to get the best of fruit and vegetable products for their table and in this respect the consumers are benefited by the new laws. We feel that the standardization of fruit and vegetable products has been the most marked advance that has come in the fruit industry during many years.

FALL WORK IN INSECT CONTROL.

By HARRY H. LADD, County Horticultural Commissioner, Stockton, Cal.

A fall clean up of weeds and grasses in the avenues and around the fences is a factor in pest control the importance of which is not generally appreciated. In San Joaquin County there are several pests which can be partially if not entirely controlled by cutting down the weeds on which they spend the winter and by cultivating the ground to kill those that hibernate in the soil.

No matter how carefully a farmer watches his insect pests, if weeds are allowed to stand throughout the winter there will be a number which will succeed in hibernating and will make trouble for him in the spring.

I think it is much better to do away with fences entirely around the farms if stock is not being raised near the farm. A real estate dealer bought an orchard for $300 per acre and by tearing down the front fence and cleaning away the weeds to the road he improved the looks of the place so much that it sold for $500 per acre in a short time.

It is very important in carrying out the clean-up idea, not only to do away with weeds and cultivate the soil, but to clean out all the trash in and around the packing sheds and to take up all old sacks and rubbish and burn them. The codling moth, the worst pest of apples and pears, finds a home in packing and cutting sheds and under trash and leaves, and it is difficult to control it without starting in by cleaning up in the fall.

If we hope to rid our places of the brown mite the best way to start is by cleaning up the weeds, especially sunflowers and morning-glory, since they carry enough red spider or brown mite to infest the orchard even though the farmer were careful to spray his trees and vines in the spring.

We have helped to get rid of the potato tuber moth to quite a large extent by having the camps where seed potatoes are cut cleaned up and the refuse burned in the fall to destroy the overwintering eggs. Some kinds of aphids can be found on mustard all through the winter. Thrips, the great pest of prune, pear and cherry trees, spend the winter in the ground in the young stages and many may be destroyed by cultivation. The brown day moth spends the winter in trash and sometimes gives trouble in the spring. The cutworm, which is one of the first to start work on the tender buds of the grape vine, spends the winter in the ground around the vine and hoeing will tend to get rid of it. The vine hopper, which has been a very troublesome pest this season is dependent on the weeds and grasses for a winter home and if these are cleaned up in the fall there will not be likely to be as many to fight with sprays the next spring. Grasshoppers lay eggs in the soil in uncultivated corners and may be reduced in numbers very appreciably by plowing such places during the winter. The grape root worm lives under the soil throughout the winter and may be greatly reduced in numbers by cultivation. The sphinx moth was so abundant in one of our vineyards a few years ago that vines were defoliated, but by plowing the pupæ of the moth under in the fall further trouble during the following spring was avoided. Among the garden pests the cabbage bugs and squash bugs depend on trash for protection during the cold season.

A clean-up week on the farms, as some cities have had, is greatly to be desired, since there is nothing that makes a county look so prosperous as having one farm after another along the road well cleaned up in the fall and the new grass coming up without having to grow through a lot of old dead weeds.

DEVELOPMENT OF THE FRUIT INDUSTRY IN SAN LUIS OBISPO COUNTY.

By S. V. CHRISTIERSON, County Horticultural Commissioner, San Luis Obispo, Cal.

Thirty years ago, nearly a thousand acres of prunes were planted in San Luis Obispo County, principally in the vicinity of Templeton, 25 miles north of San Luis Obispo, and 5 miles south of Paso Robles. Due to the prevailing low prices for prunes, and the very poor marketing facilities, these orchards were neglected and in many cases destroyed, although parts of old orchards are still standing and bearing indifferently, due mainly to lack of care.

About this time the University of California had an experiment station established near Paso Robles for the specific purpose, as far as can be ascertained, of determining the status of the section as a fruit growing venture. Due to heavy frosts almost every winter in the early nineties, the reports from this Upper Salinas Valley station were unfavorable, and although the station was continued for several years, it was finally abandoned but the unfavorable reports remained.

These reports tended to discourage people from planting orchards for a long time, however interested parties could not but notice the excellent results obtained from the old Trussler & Van Wormer orchard, situated about two miles northwest of the business center of Paso Robles, as well as other old almond orchards in the same vicinity, and in 1912 extensive plantings were started, in more favored localities than above-mentioned tracts. Notable among these new plantings are: The G. N. Talbot orchards, now comprising over 500 acres in almond trees, the Brown Bros. orchard of nearly 300 acres, and several smaller orchards of 25 to 100 acres. Although W. S. Forington, one of the pioneer fruit growers of the district, had demonstrated that prunes and apricots would do surprisingly well, and Guy C. Heaton, who put San Luis Obispo County on the map when it came to showing prize apples, demonstrated beyond a doubt that surpassingly fine apples can be grown in the county, all the new plantings in the district at this time were almonds.

This movement gave the industry the necessary impetus, and since it has grown by leaps and bounds. The first authentic figures on orchard acreage in the county, compiled by former Commissioner Carl Nichols, placed the almond acreage for the year 1916, inclusive of that year's plantings, at 3,076 acres non-bearing and 312 acres bearing almond trees. In 1917 this acreage was augmented by 2,100 acres.

About 50 per cent of the fruit tree acreage of the county consists of almonds. Prunes, pears, apricots, peaches, apples and walnuts make up the balance. Pears and prunes are planted at a lower altitude than almonds, in draws and bottom lands, where, although the soil is more fertile, almonds would not produce crops due to frost conditions. Most growers readily understand this, as the almond is the earliest blooming orchard tree we have. Hence almonds are planted on hillsides and frequently on hilltops, to secure the best obtainable air drainage, and where frost danger is minimized. Soil conditions must always be taken into consideration, as not all these soils on the numerous hillsides of San Luis Obispo County will produce almonds. The trees require a fairly deep loam, with a pervious subsoil. The presence of lime in the soil appears to be very beneficial to the almond; some orchards planted on hillsides with outcropping limestone are doing extremely well.

The purchase of the old Henry ranch by the Atascadero Holding Corporation in 1913 marked another step forward in the development of the fruit industry of the county. The plans of this gigantic enterprise include, as a main feature, the planting of a great part of the 23,000-acre estate to pears, prunes, apples, peaches and almonds. At the present time about 3,500 acres are planted to orchards which are now from 1 to 3 years old. It is planned to subdivide this estate into small lots, varying in size from villa lots to 10 and 20-acre orchard tracts, and selling on easy payments to homeseekers. The influx of many intelligent eastern investors, who since 1915 have built hundreds of beautiful homes on the estate, as well as the fine buildings, including Administration Building, Department Store and Hotel Building, and the largest printing plant between San Francisco and Los Angeles, as well as the little city of shops and warehouses erected by the corporation, cause the visitor to wonder how it could be possible to transform the wilderness of a great cattle ranch into a thriving community in the short span of four years, and to aid so greatly in the development of the natural resources of San Luis Obispo County.

During the year 1917, 3,700 acres of fruit and nut trees were planted in the county largely in the Upper Salinas Valley. Some plantings were made in the vicinity of Arroyo Grande, 20 miles south of San Luis Obispo; a place once famous at fairs and exhibits for its wonderful products in the fruit and vegetable line. This almost doubles the previous year's plantings, and increases the orchard acreage by 35 per cent. San Luis Obispo County today has 12,882 acres in bearing and non-bearing orchards.

PLANT INSPECTION IN SAN MATEO COUNTY.

By Newton Peck, County Horticultural Commissioner, San Mateo, Cal.

San Mateo County, situated on the peninsula just south of San Francisco, with a climate of abundant moisture and coolness, and with the great metropolis as a market, is practically devoted to the growing and cultivating of flowers, shrubs and ornamental plants. One going into the floral mart of San Francisco, upon inquiry will be told that 75 per cent of all the display is grown in this county. When this is understood and one looks at the many acres of landscaped grounds with their winding ways of intricate design and living walls of cypress between which grow trailing vines, roses, heliotropes, carnations, hydrangeas and myriad kinds of flowers besides, all bathed in the splendor of the California sun, and again when one considers that every valued estate has its own private greenhouse filled with exotics, most rare, imported from all parts of the world, he can imagine, if not the magnitude, at least the general scope and character of inspection in this county. Outside of our interstate shipments we have importations from many foreign countries, principally Holland, England, France and Japan.

Sometime ago the writer received a communication from the State Commissioner of Horticulture for an opinion regarding the establishment of a central point or points in San Mateo County for the inspection of all consignments. The reply was in the negative. The inspection of large boxes or cases of exotic plants packed in sawdust—plants which are carefully balled or potted—is a delicate problem, and they should be moved as little as possible after inspection. For example, I have in mind—and this is no exception to the rule—forty cases (each case weighing 700 pounds or more) that came into this county last winter from Holland. The shipment was principally azaleas and rhododendrons (balled plants). The packing was close and uniform. Between each two layers of plants was nailed a strip of wood confining each plant in its place and immovable unless the case was partially destroyed. I would invite any inspector to the pleasure of unpacking and repacking such a shipment if he considers me in error.

These conditions may not apply to every county, but any other ruling than that which I have stated would seem to me impracticable and oppressive in San Mateo County. There is a pleasing congeniality between the nurserymen and importers, and this office. There is no display of autocratic position—no loftiness of asserted superiority, but rather a disposition that all should keep within strict requirements of the law. In all my condemnations there have been no complaints, but rather an acknowledgement of the justice of plant inspection and apparent surprise that the consignor was not better posted as regards our horticultural statutes.

Due to our close proximity to the San Francisco quarantine office I can get in touch with them at any time. I can not say too much for the assistance rendered by Mr. Maskew, Mr. Compere and other members of the staff. Any commissioner or inspector who visits San Francisco and misses the opportunity of calling at this department does not do justice to his position. There is no surprise that our federal government speaks of it as the most perfect quarantine system in the world. Indefatigable workers, each and every one. They can conscientiously and justly subscribe themselves to the motto which they have appropriately adopted, "Finis rationem excusat."

THE AVOCADO IN SANTA BARBARA COUNTY.

By C. W. BEERS, County Horticultural Commissioner, Santa Barbara, Cal.

The avocado is an old settler in Santa Barbara County, having come here very soon after the introduction of this fruit into the United States. From the moment that the tree sunk its roots into the warm, fertile soil of the Montecito Valley and pushed its head up into the balmy, delightful atmosphere that lies so affectionately against the bosom of the foothills it has been at home and has grown luxuriantly and persistently until now thousands of the trees are found scattered throughout the sixty miles of coast country from the Rincon to Point Concepcion.

In 1870 Silas Bond, then living in Montecito, in his search for new plants and new fruits to bring to the town which he so dearly loved, secured from his old friend, Dr. Kellogg of San Francisco, known throughout the state of California for his active interest in introducing new and valuable fruits and ornamental shrubs and trees, some avocado seedlings which he had obtained from Mexico. One of these Mr. Bond planted at his home in Montecito and the other he gave to his neighbor, Judge Ord, and it was planted at the Ord home in the village. Both of these trees grew thriftily, but the tree at Judge Ord's place never bore fruit of any size. The one at Mr. Bond's home, however, produced enough for two trees.

Mr. Frank Gallaher told the writer that he secured seeds from Mr. Bond's tree for a number of seedlings that were planted on his home place in Montecito and these magnificent specimens are still in bearing. About the same time Mr. Kenton Stevens planted about a hundred seedlings from the Bond tree and those which have not been removed remain today large, thrifty specimens.

In the fall of 1911 Mr. Sexton visited Honolulu for the express purpose of sampling the avocado and of collecting seed from the choice fruit, that he might introduce the best varieties of the Islands into California. He brought home with him a quantity of seeds, the seedlings from which have been distributed throughout the state for the good of the industry. Mr. Sexton hoped in this way to add to the splendid varieties already available.

In October of 1912 Mr. Sexton placed a bud of the Dr. White avocado on one of his trees and within 22 months he had sixty matured fruits, after stripping half of the sets from the tree. So prolific is this tree that he gathers fruits almost every month in the year. In 1913 he brought home from Honolulu buds of the nutmeg avocado, which have developed into a beautiful tree, passing through the severe winter of a few years ago unhurt. This is counted one of the latest varieties, being only second to the Inezholt for size of fruits. It is of the Guatemalan type, each fruit weighing from one and one-half to two pounds.

In the experimental grounds at the Sexton home are 78 varieties, many of them in fruit. The climatic conditions in this particular locality afford an excellent opportunity for testing out the comparative hardiness of varieties, as there are frequent heavy frosts both in the spring and in the fall.

In 1916 Mr. Sexton made his last trip to Hawaii, selecting bud wood from four of the most desirable trees; there are from eight to ten growing trees of each variety thus brought in. This wood arrived after his death. In 1911 Mr. O. N. Cadwell of Carpinteria planted 60 seedlings which, in 1916, produced an income of $20 per tree. None of these trees have been budded. The planting by Mr. P. H. Rice of 120 Hawaiian seedlings is one of the early orchards. The white avocado has won recognition for itself and the Rainey is a desirable fruit, originating in this city.

And so the avocado has come to stay. Bearing trees are found in hundreds of the local gardens and the more they are known the better they are liked. They have been selected by the park commissioners for one of the principal streets in the city and already the beautiful evergreens are awakening the inquiry of the many travelers who visit the place, because of their beautiful foliage. By and by, as the visitors drive through the residence portion, they may see hanging to the trees the sign that is sometimes seen fastened to the fences when the roses are in bloom, "Strangers are invited to help themselves." Then the avocado fruit will make itself known to thousands of people who now think that the alligator pear is a kind of wild animal food.

APRICOT TROUBLES.

By Earl L. Morris, County Horticultural Commissioner, San Jose, Cal.

The following is a popular account of two abnormal conditions which may arise during the early life of an apricot orchard. There has been a tendency to include both of these and others under the term "sour sap," which may be used to indicate conditions resulting in the dying and later souring of the cambium layer, the growing portion of the tree between the bark and the wood. In fact, this term has been applied to conditions not even characterized by sour sap.

Often in young orchards from one to three years old many trees fail to start normally in the spring or having started die back in from 30 to 60 days. In either case an examination shows the roots to be in good condition but reveals a dead, sour cambium layer nearly or quite surrounding the tree generally near or at the ground. Usually in such cases a vigorous shoot appears just above the union which will make a large tree much quicker than one can be grown from a replant since the root system is already established. If for reasons to be discussed later it seems best to replaut there need be no fear of a fatal disease passing from the dead tree to the replant in the same hole. If a tree is grown from the old root and new shoot the great danger is that fungi causing wood decay may find entrance where the dead stump has been removed before the new growth has closed over it, and that in ten or fifteen years the tree will be weak at that point. Great care must be taken to protect the wounds and even then there is danger of infection.

Whether it is best to try to make a tree from a sound root which has been in orchard form more than one year, if the whole top must be removed, or whether it is best to replant, can be determined only by future observations. That a good growth will come from such a root is certain. Two years time and the cost of trees and labor is very little compared with the possible loss of trees after they have come into full bearing. Some orchardists believe that either method is safe while others hold that replanting is necessary. There do not seem to be any carefully recorded observations to determine this point. Further discussion might prove helpful.

Another condition wholly distinct from the above is found to be most serious in trees from three to eight years old. It does not show in the spring. The trees grow normally until about the first or middle of June when the leaves at the tip of a branch wilt rather suddenly. This wilting may extend to other branches and in some instances over the whole tree. The first wilting may appear any time from June to November. The affected portion may make a feeble effort to put out new leaves which never amount to anything. Except in very severe cases the portion of the tree below the wilt will start and grow normally the next spring. The wilt may or may not appear later. The fact that a few trees in an orchard are affected does not mean that all the trees will become so. Neither does it mean that the particular diseased trees are necessarily going to die. A few may die but if proper precautions are observed most of them should make good profitable trees. Examination of a cross section of an affected limb shows brown or black heartwood, which has given rise to the local name of "blackheart." Investigations carried on by the Department of Plant Pathology of our State Experiment Station show this trouble to be caused by a fungus growing in the wood. There is no way of removing the fungus once it has entered, and no known way of preventing it from entering. It seems to be much more prevalent in irrigated, rapid growing orchards than in nonirrigated, slower growing ones. This is particularly noticeable in orchards intercropped with tomatoes which require much irrigation and permit comparatively little cultivation. While this disease can not be wholly prevented much can be done to keep it down. Keep the soil moisture constant and moderate by repeated cultivations rather than by irrigation. If the land must be irrigated do not wait until the growth of the trees has been checked and do not apply an excessive amount of water. Endeavor to keep the trees growing constantly but not too rapidly during the entire growing period. "Blackheart" seldom occurs in nursery stock, but a careful inspection should be made when the trees are headed back for planting and any thrown out which are diseased.

THE APPLE LEAF-MINING CASE-BEARER

(*Coleophora volckei,* n. sp.[1])

By W. H. Volck, County Horticultural Commissioner, Watsonville, Cal.

For several years past a certain type of injury has been more or less in evidence on Pajaro Valley apples at harvest time. This injury consists in one or more small punctures in the skin and extending a short distance into the pulp. Unlike the bites of caterpillars, such as the tussock moth, these punctures are not usually[2] healed with scar tissue, but the uneaten flesh dries back a distance so forming a circular dead spot, dark brown to black in color. Often there is a dried exudate of whitish color extending from the mouth of the punctures. This exudate is evidently sap which has oozed from the injured flesh and evaporated over a considerable period of time.

For a long time these injuries were not ascribed to any specific insect, but rather thought to be due to the work of small larvæ of perhaps several species. Among these the fruit-tree leaf roller (*Archips argyrospila,* Walker) was considered the most responsible.

The particular type of injury just described became increasingly abundant in the Rodgers Bros'. orchard, and finally Mr. C. J. Rodgers observed a small case-bearer larva which he believed to be the specific cause of the injury. The following season (1916) the writer made a study of the life history and habits of this caterpillar. It was soon established that it was responsible for the particular type of injury in question. It was also established that the presence of this insect on the fruit was accidental, the principal food being the foliage. The feeding is done between the two surfaces of the leaf in the same way that a true leaf miner does its injury. The caterpillar is in reality a leaf-mining case bearer, moving about within the protection of a case composed of leaf epidermis. This case appears to be enlarged to accommodate the growth of the caterpillar by adding larger strips of epidermis.

The feeding larvæ usually locate on the under surfaces of the leaves, but occasionally on the fruit. The feeding habits are easily studied when the larvæ are working between the surfaces of leaves. After loosely attaching the edge of the case to the leaf surface the larva eats through the epidermis and begins feeding on the cells between the leaf skins. As the cells are removed the leaf skins become flexible to an extent which admits more and more of the body of the insect between them. In this way the larvæ enlarges the mine until it has to stretch full length from the mouth of the case in order to feed. Very rarely the older larvæ have been observed to leave the case entirely, and live for a time as true leaf miners. The actual movements of feeding are easily observed by holding the leaf up to the light. As soon as the larva has become accustomed to handling it will proceed to feed. Annoyance of any sort is likely to cause it to retreat into its case.

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[1] Named by J. N. Heinrich of Bureau of Entomology, U. S. D. A., and description not yet published.

[2] The failure to heal is due to the fact that the punctures have been made at too late a date for the apple cells to divide and form new tissue. However, if the very young fruit is attacked the punctures do heal with the formation of depressed regions or pits. These pits vary from one-eighth to one-quarter inches in diameter and one-sixteenth to one-eighth inches in depth. This form of injury is much less common than the unhealed punctures.

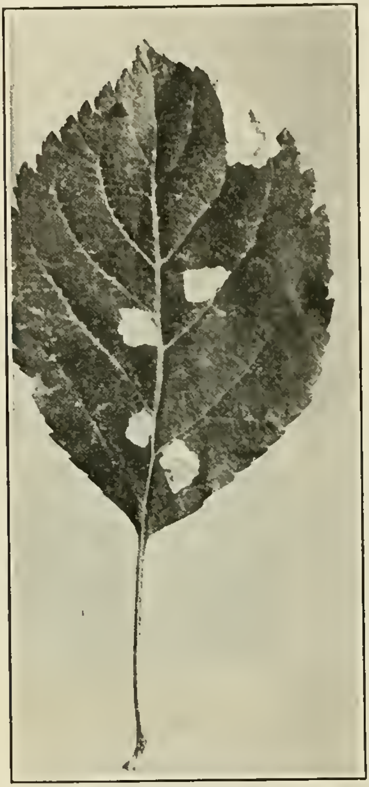

FIG. 139. Characteristic leaf mines of *C. volckei*. (Original.)

In the study of the life history of this insect the nearly adult larvæ were collected and placed in paper-bag breeding cages. The bags were tied over apple twigs to retain the insects with a supply of natural food. In addition to the paper-bag colonies some collections were reared on green apples in the laboratory.

In 1916 the first adults were obtained on May 23. The moths lived three to five weeks in the paper-bag cages and the first eggs were observed on July 5. Evidently egg laying had been in progress for some time, as about half were hatched. The eggs continued hatching until July 15. These eggs are not readily seen without a hand lens, and are so obscurely placed on the under sides of the leaves among the plant hairs that the failure to see them immediately is explained. The unhatched eggs are light yellowish green, nearly hemispherical and decidedly fluted. The flat surface is tightly pressed against the leaf surface.

On hatching the young larvæ bore directly into the leaf through the bottom of the egg. For at least one and possibly two instars the young caterpillars remain within the leaf as true leaf miners. However this may be, small larvæ in cases were first observed on August 13.

These young larvæ continue to feed during the summer and fall, but do not become more than one-fourth grown before the beginning of the hibernating period. These larvæ were found hibernating on the twigs and bud scales as early as November 3. After this date the number of hibernating specimens increased very rapidly and apparently very few of the insects fell with the foliage. The hibernation is, of course, conducted within the case which is securely attached to the twig by silk.

The period of hibernation continued until the blossoms were opening in the following spring. There appears to be two spring molts, and the larvæ grow rapidly until pupation which extends from the middle of May to the middle of June. Pupation takes place in the case of the mature larva and the moth emerges from the rear portion of this case.

The feeding larvæ are seldom found except attached to the under side of the leaves while the pupæ are most frequently attached to the upper surfaces. Pupæ are also found attached to twigs and fruit. It is the more mature or spring form of the larvæ which are likely to injure the fruit. The extent of the injury to the fruit appears to depend on the relative abundance of the larvæ which largely by accident leave the foliage and attack the fruit.

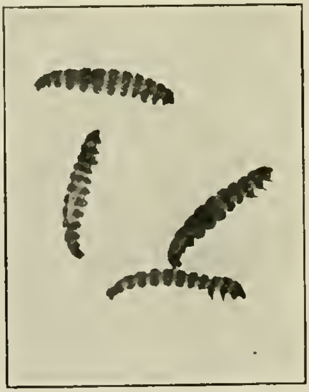

FIG. 140. Larvæ of the apple leaf-mining case-bearer greatly enlarged. (Original.)

The mature larvæ are about 9/32 inches long and the moths practically the same length from the tip of the head to the tip of the wings. The body color of the moth is silver gray and also the short scales of the wings, but the long scales or fringes are brown. The moth is inclined to concealment and has never been observed by the writer except when reared in captivity.

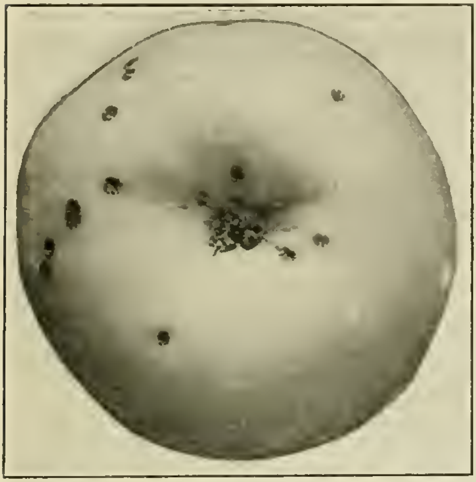

FIG. 141. A form of injury, somewhat uncommon, by *C. volckei*. (Original.)

In May of 1917 a number of mature larvæ and pupæ were forwarded to the Bureau of Entomology, United States Department of Agriculture, and the moths which emerged were determined by Mr. J. N. Heinrich as a new species and named by him *Coleophora volckei*. So far as I am aware the description has not yet been published.

The genus *Coleophora* of the lepidopterous family Elachistidæ is represented in California by 15 species, according to Woodworth.[3] That the subject species is probably native is well supported by the co-occurrence of such a number of the members of this genus. Several searches were made to locate the species on native vegetation, but all of these failed. This summer a pupa case was accidently found on wild blackberry in the Santa Cruz Mountains about thirty-five miles from the orchards in which the insect has become troublesome.

Perhaps the most peculiar feature connected with this species is its localized occurrence in the apple orchards of the Pajaro Valley. These infestations may be described as colonies separated by considerable distances. While *C. volckei* is a comparatively slow breeder with only one generation a year, it is so well protected by its case and its leaf-mining habits that its spread should be equally sure. The case, and habit of exclusively internal feeding completely protects this species from injury by arsenical sprays in the summer and lime-sulfur in the winter. Oil emulsions, unless applied with great thoroughness and at very heavy concentrations, also fail to kill the hibernating larvæ. In fact, it appears that no practical percentage of oil will give control of the insect.

C. volckei is apparently almost free from injury, by natural enemies as the parasites reared from collections have never exceeded three per cent of the pupæ.[4]

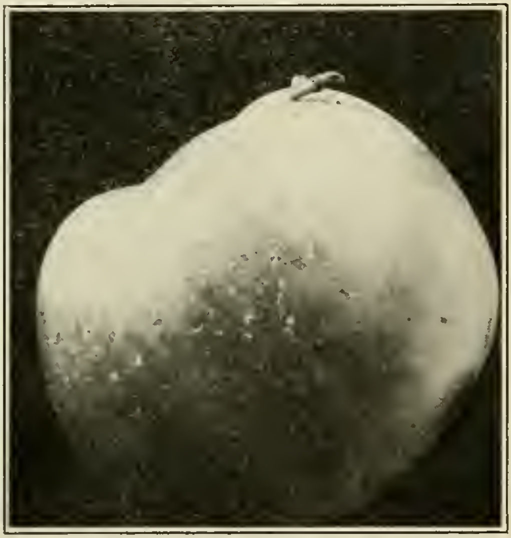

FIG. 142. Pupa of *C. volckei*, natural size. (Original.)

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[3] Guide to California Insects.

[4] Mr. A. B. Gahan of the Bureau of Entomology, U. S. D. A., has identified a parasite reared from this insect as a species of *Microbracon*.

Clearly *C. volckei* present a special problem in methods of control. The writer has conducted some experiments with this end in view and which are here briefly recounted.

As most of the larvæ are feeding on the leaves in the early fall it should be possible to greatly reduce their numbers by defoliation just after the fruit is picked. Accordingly some plots were sprayed with crude oil emulsion and lime-sulfur solution at full winter strength, also strong solutions of nitrate of soda with caustic soda and sodium sulfide. These materials were applied during the last week in October and soon after the fruit was picked. As defoliaters, crude oil emulsion and lime-sulfur solution were not successful, the shedding date being only slightly advanced by their use. The caustic solutions with sodium nitrate proved too strong, killing the foliage too quickly to allow of shedding.

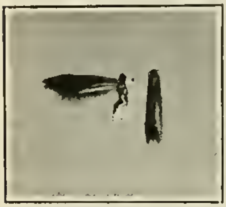
FIG. 143. Adults of the apple leaf-mining case - bearer, somewhat enlarged. (Original.)

From these results it appears that a successful defoliating spray is in itself a problem. In order to be successful as intended in the case of *C. volckei* the defoliating action will have to be very rapid. The fruit is seldom entirely removed from the orchards before the middle of October and hibernation begins in November.

The sprayed plots were inspected at intervals during the fall and winter. These observations led to the conclusion that the hibernating larvæ were practically as abundant on the crude oil and lime-sulfur plots as on the checks. (The nitrate and lye plots were located in a portion of the orchard quite free from the insect.) On the crude oil plot some of the cases were found to be penetrated and the larvæ killed. The percentage of killing was, however, much too low to effect control. Standard crude oil winter spraying is even less likely to be effective on account of the lower concentration, 12 per cent against 15 per cent in the experiment.

There remained one other method of attack, namely, the use of some contact insecticide early in the spring or when the larvæ were leaving hibernation. Some previous work with nicotine sulfate[5] suggested nicotine as probably the most promising material.

On March 28, 1917, the first larvæ were found feeding on the young foliage. A few of these were treated in the laboratory with nicotine sulfate at strengths of 1 to 800 and 1 to 400. The results of this experiment were promising so some plots were sprayed on April 5, with the following formula:

Nicotine sulfate	3 pounds
Flour paste (made with 8 pounds flour)	8 pounds
Milled sulfur	12 pounds
Water to make	200 gallons

The plots treated with this formula included those receiving the oil and lime-sulfur experimental spraying and a third plot, just adjoining, which received only the standard winter spraying with crude oil emulsion. A second nicotine spraying with practically the same formula was applied to these plots about May 2.

General observations indicate that there has been a great reduction in the numbers of *C. volckei* within the nicotine-sprayed plots. The actual fruit counts as recorded in the accompanying table substantiate these observations to a marked degree, especially when the natural distribution of the species is taken into consideration.

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[5] Nicotine Sulfate for Codling Moth Control, Annual Report of the Horticultural Department, Yakima County, Wash., 1916.

													Check plots.			
Rows of trees as numbered in plots	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B	7A	7B	8A	B14
Per cent of fruit showing no insect injury	85	87	93	85	87	94	98	98	92	88	92	91	72	79	85	88
Per cent of fruit showing injuries caused by *Coleophora volckei*	2	2	3	2	3	3	0	0	0	3	1	1	18	17	9	6
Per cent of fruit showing injuries caused by fruit leaf roller	9	8	1	9	3	2	1	2	5	4	3	2	3	2	3	3
Per cent of fruit showing injuries caused by caterpillars, such as Tussock caterpillar	3	2	2	3	4	1	1	0	1	3	1	5	3	2	3	3
Per cent of fruit showing injury caused by the codling moth	0	1	1	1	1	1	0	0	0	2	1	1	1	0	0	0
Per cent of fruit showing injuries caused by insects not listed above	1	0	0	0	2	0	0	0	2	1	2	0	2	0	1	0
Per cent of foliage showing injury by *Coleophora volckei*—																
Produced by small larvæ	7	5	2	7	3	8	2	9	11	12	22	12	1	0	1	3
Produced by adult larvæ	3	2	0	3	3	2	0	6	0	1	3	0	36	25	25	9
Total	10	7	2	10	6	10	2	9	11	13	25	12	37	25	26	12
Rows receiving defoliating sprays	V	O	V	O	X	O	X	O	O	O	O	O	O	O	O	O
Rows receiving standard winter sprays	X	V	O	V	O	V	V	V	V	V	V	V	V	V	V	V
First spring spraying	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	B	B	B	B
Second spring spraying	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	Z	B	B	B	B

X = Lime sulfur. V = Crude oil emulsion. O = Unsprayed. Z = Nicotine sulfate and milled sulfur. B = Lead arsenate and milled sulfur.

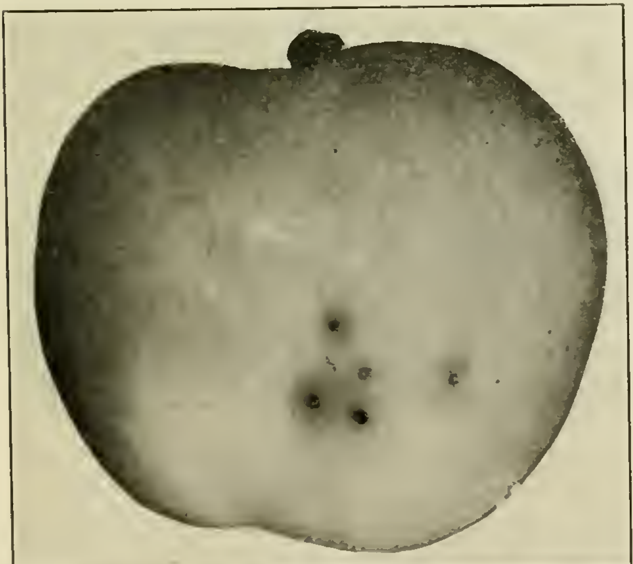

FIG. No. 144. Characteristic injury to apple by *C. volckei* (Original).

Referring to the table it is seen that the A sections of the plots are not materially different from the B sections; however, there may have been a slight advantage from the defoliating spray applications, since the natural abundance of *C. volckei* decreases towards row B 14. In fact, the corner represented by rows 1, 2, 3, 4, 5, 6, A was the most heavily-infested portion of the orchard.

In comparing the sprayed rows with checks the results obtained from the foliage are as interesting as the fruit counts. Here it is seen that the relation between the number of mines produced by small and by adult larvæ changes abruptly between the check and sprayed rows.

It appears from a general survey of the results that nicotine sulfate is capable of a very marked control of *Coleophora volckei*, but that the control of the codling moth and the fruit tree leaf roller is doubtful or not so good as with arsenicals.

THE OLIVE INDUSTRY IN SHASTA COUNTY.

By GEO. A. LAMIMAN, County Horticultural Commissioner, Anderson, Cal.

Shasta County is destined to become the greatest olive producing section of the United States.

The olive has its sentimental side, being an emblem of peace. It was brought to this state by the Franciscan friars before there was any thought of the American Revolution and was one of the earliest cultivated fruits of California. It is only of recent years that the northern races have learned to appreciate the value of the olive as food and because of the wholesome oil made from it. Today the demand for the ripe pickled olive and olive oil is growing by leaps and bounds. The olive is coming to its own as the nation learns the real value of a staple product.

The olive has many advantages as an orchard product. It thrives on gravelly land, which otherwise looks hopeless to the farmer who has become used to rich deep loams. While the tree begins to bear in its fourth or fifth year and becomes important in a few years more, it is still a young tree when it is 100 years old. The olive blooms late in the spring, when there is little danger from frosts or late rains, and ripens over a considerable period, making it comparatively easy for the grower to gather his fruit.

Shasta County has within its borders one of the largest olive groves in the state, the Monte Vista grove in Happy Valley. This grove having 120 acres, now in full bearing, demonstrates the adaptability of the soil and climate to olive culture. The fruit here ripens two weeks earlier than in sections farther south, and this makes the crop more desirable for pickling and oil purposes, permitting a longer producing season, thus increasing plant capacity. The planting of olives at the Monte Vista grove has been extended the past three or four years until now the acreage has increased in this holding to about one thousand acres. The trees are planted 40 feet each way and interplanted with peach or plums of good shipping qualities, which come into bearing somewhat earlier than the olive and may remain a number of years before being removed and the land given over to the olive entirely.

The land area available for olive culture in Shasta County is large, as many thousands of acres of bench lands are suitable for their culture. The olive in Shasta County is absolutely free from all insect pests and diseases. No black scale or olive knot have ever been found here and the most rigid inspection is given to all incoming stock, for planting, to guard against any importation of pests or disease. The olive responds to good care as well as other orchard trees. After the crop is gathered broken and interfering branches are removed and the tree is thinned out to let in sunshine and air. Cover crops of vetch and oats are grown during the fall and winter season and are plowed under in the spring. This has been practiced now for several seasons and the results are very noticeable and lands so treated are in better condition as to retention of moisture and tillage. The vetch is inoculated with the proper bacteria with good results, a better growth showing each season.

HORTICULTURAL POSSIBILITIES OF SISKIYOU COUNTY.

By W. L. Kleaver, County Horticultural Commissioner, Yreka, Cal.

Siskiyou County, situated in the extreme northern part of the state, is an empire within itself. Although classed as a mountain county, yet one-fourth of its four million acres are valley lands drained by several good-sized rivers. The resources of this county are various; although, as yet, many are quite undeveloped; particularly is this true of our horticultural possibilities.

Siskiyou is far famed for its climate; here we have the four seasons well defined. The rarefied atmosphere, low in humidity, together with the tempering of the sun's rays and cool nights, combine their effects in rendering fruit of the richest hues and most delicious flavor. Fruit of all kinds, except those peculiar to a tropical climate, grow and ripen to perfection. True there are sections of the county where late frosts render a crop uncertain; but, generally, due largely to a free circulation of mild air throughout these mountain valleys, a fair crop is assured every season.

While at present fruit is not being produced to any great commercial extent, yet nearly every farm has its own orchard to supply the home and local needs. It may be said that what we lack in quantity we make up in quality.

Berries of all kinds grow to perfection, particularly in the southern part of the county in the famous Strawberry Valley. Here the lands, which were formerly covered with vast forests, are being cleared and the acreages in fruits, vegetable gardens, etc., are gradually being increased.

The Klamath River Valley, which extends through this county for a distance of more than one hundred twenty miles, is perhaps the section for the choicest fruits of all sorts. This valley is nowhere as wide as the valleys of its tributaries, the Scott and Shasta rivers, yet along its course are to be found a series of sunny benches of well drained fertile soil. The mountain streams furnish an abundance of water for irrigation purposes. This section, for the most part, is quite new in a horticultural way, due to the fact that it is only now being opened to the outside world with suitable wagon roads; we hope to see it have railroad advantages in the near future. Here we get our most delicious apples, pears, peaches, etc. It has been fully demonstrated that the moist well-drained loams along this river valley are particularly well suited to the growth of the various nut trees. Walnuts, almonds and other nuts are being produced most successfully. We predict rapid growth in this section.

The various resources of our county are being developed, the population will continue to increase, and the horticultural interests will surely keep pace with the other advancements.

PROGRAM FOR WORK IN SOLANO COUNTY.

By G. M. Gates, County Horticultural Commissioner, Vacaville, Cal.

Having only recently been appointed to the position of horticultural commissioner of Solano County, this article can not deal with past achievements and must necessarily be confined to a discussion of the present and future possibilities for the work in the county.

For a number of years this county has been without the services of a commissioner of horticulture. During this time the doors have been wide open for the importation of diseased, insect-infested, and otherwise undesirable nursery stock and plants. The chances which have been taken by the fruit growers were such as can not be safely afforded by an important fruit growing community such as we have represented by the Suisun and Vaca valleys. Now that we have again taken our place by the side of those progressive counties which have recognized the important horticultural interests by supporting a county horticultural commissioner, we propose to serve and protect this county in just as effective a manner.

In the inspection of incoming nursery stock and plants the greatest care will be exercised. Nurserymen as a rule are reliable business men, but none can prevent the occasional shipment ot stock that is diseased or insect-infested, for with the greatest of care on the part of the nurserymen employees will sometimes get careless, and undesirable or dangerous shipments will be made.

It is not expected that the work of controlling insect pests and diseases of the orchard will be heavy. The growers of Solano County as a whole are up-to-date and give their orchards the best possible care, realizing that only healthy and thrifty trees will give maximum crops and financial returns.

The last legislature, in placing the eradication or control of ground squirrels in the hands of the county horticultural commissioners, added another very important duty to the list of those already assigned. In the valleys where intensive cultivation is practiced there is usually little trouble from these pests; not so on the hillsides where they play havoc with grain and forage crops. Community effort in poisoning has resulted in much benefit, and such work needs general encouragement.

The duties of the commissioner in the enforcement of standardization laws are very important. Solano County is a heavy producer of plums, apricots, cherries, pears and other fresh fruits, and the protection of the fresh fruit shipping industry through the regulation of the pack should result in great good to the county.

The work is begun with a realization of its magnitude and possibilities; the cooperation of the fruit growing interests of the county is expected, and it will be my earnest endeavor to serve Solano County to the very best of my knowledge and ability.

TOBACCO TREATMENT FOR APHIDS.

By O. E. Bremner, County Horticultural Commissioner, Santa Rosa, Cal.

It has been well established for a number of years that tobacco extracts or nicotine sprays are effective in the control of aphids and other soft-bodied insects. However, the most efficient means of application, as well as the most economic solutions to use, are problems with which we still wrestle.

During the past few years the Pacific coast has been waging an uphill fight against an increasing loss from the depredations of various forms of aphids, and perhaps the hardest attack has been against the apple trees, prunes, walnuts and pears also suffering greatly. The appearance of the pear-root aphis has spurred us to greater activities to find some remedy for root-infesting forms. With this end in view, the soil around some old greening apple trees which were infested with woolly aphis was well saturated with a solution of "*Black Leaf* 40" at a strength of about 1 part of the solution to 1,000 parts of water. Shortly before treatment the soil was spaded and the feeding roots were found to be white with woolly aphis, but today these trees are almost free from aphis and no solution for control has been used on the tree itself.

The success of this experiment led us to carry on a larger one last season and in this case a plot of 30 apples and 270 old pear trees was used. This orchard when inspected by Mr. Weldon and myself a few years ago was badly infested with the pear-root aphis and woolly aphis; the soil is of a sandy loam texture and situated so as to be well drained. Instead of using tobacco extract we used tobacco waste. Twenty-five hundred tobacco plants were grown, being set 12 inches by 3 feet 10 inches in rows on a plot of good ground. From the tobacco produced 555 pounds of cured leaf was sold at 20 cents per pound; the refuse was chopped and placed in trenches around the trees, 5 pounds being used for each tree. The first was applied in November, the rest toward the end of February and it was the last application that gave success, for it is extremely hard to find an aphid in this orchard today except on the eight trees where the tobacco was applied in November.

When it is not possible to grow tobacco, the waste from cigar factories can be procured very cheaply. Last year we bought it in bales at 1½ cents per pound f. o. b. San Francisco; this brings the cost per tree down very low. In one case this waste was used as a spray; it was soaked in the bale in 2,000-gallon tanks, first at the rate of 1 pound of waste to 4 gallons of water for 48 hours, then the same tobacco was put into another tank at the rate of 1 pound to 2 gallons of water for 4 days. A chemical analysis by the insecticide laboratory at Berkeley of the solution in the first tank, showed that it contained .02 per cent of nicotine or practically the same amount as a 1 to 2,000 dilution of "*Black Leaf* 40."

The spray tank was loaded directly from the tanks and the solution used in combination with commercial flour paste jelly 6 pounds to 100 gallons, and atomic sulfur 10 pounds to 100 gallons. This combination not only cleaned the trees of aphis and red spider but also canker worms and tent caterpillars. While this treatment for root infesting forms of aphids is still in the experimental stage, we believe it will recommend itself to the horticultural commissioners and growers for at least a trial.

CANTALOUPE INDUSTRY IN STANISLAUS COUNTY IS HELPED BY STANDARD LAW.

By A. L. RUTHERFORD, County Horticultural Commissioner, Modesto, Cal.

During 1914 the cantaloupe season opened with a good Eastern market, good demand and excellent prices, but through the greed of the packers and growers every kind of melon was shipped. The market was flooded with an assortment of melons, large and small, and ripe and green, all in the same crates. The result was that one purchase by the eastern consumer was enough to convince him that California cantaloupes were unsatisfactory. The consumer found that less than 50 per cent of the melons in a crate were fit for consumption, so he refused to pay more than 50 per cent of the value of a good crate. The result was that after the first few shipments were sold at a good price the grower received a price that barely paid for the cost of picking, packing and crate.

With the advent of standardization in 1915 a change was noted, conformity to regulation being observed although the law did not become effective until the season was nearly over. Prices were strong most of the season. In 1916, the law being somewhat imperfect, the work of inspection was more or less handicapped, but the good effect became fully apparent. However, the standard pack was so limited that many large, wholesome melons could not be packed in the crates on hand, and the commissioner was advised by legal counsel that it was not advisable to carry out the law as it was written, and further that the law did not provide authority for the seizure of unlawfully-packed melons. Although proper inspection was thus curtailed, the crop of 1916 was handled with profit.

The 1916 season's operation demonstrated the weakness of the standardization law and the 1917 legislature was able to make amendments and corrections of real worth for the present law.

In Stanislaus County the inspectors began in July to advise the growers, buyers and packers. This work of instruction seemed to be bringing good results until about August 10, when it became evident that a number of growers and packers would not conform to the provisions of the law until forcible means were adopted. Orders were issued to arrest any grower, buyer or packer who violated the law after having been notified of the requirements. Four arrests were made August 10, and a number since that time. All the delinquents, with the exception of two, pleaded guilty, paid fines and promised to observe thereafter the regulations of the law.

One of the two who refused to pay his fine has served notice of appeal to test the constitutionality of the law. The law provides that each crate of cantaloupes must be marked either as "standard" or "irregular," with the number of melons contained therein, and the packer's or shipper's name and address. Melons must be sufficiently matured, uniform in size and ripeness, fully netted and free from insect infection. It was necessary to enforce all requirements of the law upon several hundred growers, many of whom could not speak the English language. Many of these ignored the marking entirely and paid little attention to the other requirements. They were finally convinced that this neglect must stop. Even then it was found that melons of uneven ripeness were packed in the center of crates, the packer trying to work in all his melons. If ripe melons were bringing higher prices, green melons would be found in the centers, and if green melons topped the market, overripe pickings were discovered in the crate centers. Upon discovering these deceptions, the packers inspectors were accused of incompetence.

A surprising number of crates were found unfit for consumption that had passed inspection of so-called "experts" employed by the packers. The official inspectors were mistaken in only a few cases, and the result of their work has been the rejection of hundreds of crates of green and over-ripe melons, and the repacking of many crates.

At the same time, many inferior crates have been passed but the work in the main has been satisfactory. The pack has been shipped in 100 per cent better condition than ever before, and it is hoped that next year a perfect pack may be secured.

There is a feeling among the trade members that the "Pony" standard 54 pack should be eliminated, this one classification giving more trouble than all others.

There is little doubt that one of the packers arrested for failure to properly mark his crates intends to test the constitutionality of the law. If the law is sustained there will be no reason for further imposition upon the consumer, and then the marking "Stanislaus" or "Turlock" on a crate of cantaloupes will be a guarantee of quality. Realizing the permanent value of this hoped-for condition, the larger number of growers and packers are supporting the commissioner and endorsing the course followed this season by the official inspectors.

THIRTY YEARS WITH RED SPIDER.

By H. P. Stabler, County Horticultural Commissioner, Yuba City, Cal.

In 1885 we planted an orchard of 100 acres of deciduous fruit trees in Sutter County. Twenty-five acres were devoted to prune trees while the rest of the place was divided between peaches, apricots, plums and nectarines. The season was dry, no rain falling after the first week of January. In July our troubles began as the prunes became infested with red spider. Sprinkling the trees with water was suggested as a control measure and as we knew of nothing better we deluged the foliage, using the old reliable garden sprinkling can. In a few days reinfestation occurred and we repeated the application. Several times during the season we had recourse to the water pots, saving much of the foliage.

An interplanting of Hubbard squash and pumpkins was infested so we burned the vines and cultivated the ground. Grasshoppers appeared that year in great swarms, destroying the foliage saved from the spider attack. Of the 2,000 prune trees planted 50 per cent were lost and were replanted the next year.

Red spider infestation occurred in 1886 and the water treatment was repeated several times with partial control. In those days the spider was seemingly not well distributed, as some orchards, even in the vicinity of ours, were not attacked. About 1888 the late Mr. Geo. F. Ditzler, manager of the Hatch & Rock orchard, Biggs, Butte County, told us of the use of dry sulfur for control of red spider. At the next appearance of the pest we dusted the foliage of the prune trees with dry sulfur and the results were successful. A can with perforated bottom was the implement used in this work. For several succeeding years this treatment was given during the first week of July and red spider troubles were at an end.

Even in the nineties red spider was not generally a troublesome pest in the county, so we felt that after having treated the trees so often we would omit the sulfur one season. The result was disastrous: Off went the foliage with resulting sun burning of the fruit. Thereafter the sulfuring during the first week of July was never overlooked, spider or no spider. The orchard, which was on Myrobolan root, is still standing and bearing fruit, with green leaves during the entire season. After the trees became full grown it required a pound and a quarter of dry sulphur to the tree, using the crude can with perforated bottom system of applying the sulfur. When sulfur was $1.50 a sack it was not as important as it is today to cut down the expense of materials, but now at four cents or more a pound the improved dusting machines and the finely-ground dusting sulfurs are recommended. On large trees spraying with sulfur paste has advantages over the dusting in some instances.

The use of sulfur in red spider control soon became general, but strange to say not always with good results. While, as I have described above, our control was all that could be desired I have myself seen red spider alive on well sulfured orchards. We did not know some years ago that the adult was resistant to sulfur fumes and that only the young mites were controlled. Many growers applied the sulfur too late to secure results.

We always used the sulfur the first week in July not because we knew that was the best time, in fact we believed it would have been effective at any time during the season, but it happened to be a convenient time. Early peaches and apricots were always picked, dried and shipped by the fourth of July and about ten days elapsed before we began picking cling peaches. These ten days were always a slack time in the orchard so we did the sulfuring then as a matter of convenience. In all the years I have watched the spider in this county I have never seen orchard trees infested until the first of July. At that time it can be seen on the lowest leaves of the tree. Sulfuring done within a week of that time must then be most effective as there are few or no adults, which are resistant to sulfur, and there are many young spiders which are readily controlled by the fumes.

THE STATUS OF THE PEACH INDUSTRY IN TEHAMA COUNTY.

By Chas. B. Weeks, County Horticultural Commissioner, Red Bluff, Cal.

During the years 1912–13–14–15 it was extremely difficult for any one growing drying varieties of peaches to understand why the word peach was in any way synonymous with that which was fair and beautiful, for during these years practically every grower in the state, as well as Tehama County, found the production of peaches a losing venture. The formation of the California Peach Growers Association, however, in time to handle the 1916 crop, evidently has furnished the necessary relief and has enabled growers to take renewed interest in this product.

During the late eighties and early nineties the section of Tehama County lying along Deer Creek near Vina was a very large producer of low-grade dried peaches of what was then known as "China" fruit, that is, practically all the orchards were leased to Chinamen whose chief aim was to produce the largest quantity of fruit at the minimum of expense which resulted in some very peculiar methods of harvesting and drying. The budded varieties in those days were very scarce, the majority of trees being seedlings, resulting in a heterogeneous lot of peaches of all colors, sizes and shapes, the majority of which had flesh that was very soft and watery and in no way fit for drying. The fruit was shaken from the trees on the ground when it became dead ripe, and as the soil was a soft black sandy loam a very large amount of said soil remained permanently attached to the peaches. During the early part of this period but little was known as to the best methods of sulfuring and drying fruit, which resulted in the fruit being cut in halves, thrown back into the boxes, which were then stacked in imperfectly constructed sulfur houses, and allowed to sulfur for a short time. Instead of being placed in trays the fruit was dumped on platforms to dry. Later in the game trays were used, which resulted in better sulfuring and drying, but, of course, did not improve the quality of the original fruit or get rid of any of the dirt which was accumulated in the process of picking. This method of harvesting and cultivating resulted in a grade of fruit which had a very unattractive appearance to say the least, and while most of the dirt which it contained was of the kind known as "clean" dirt, the fruit was certainly not clean to look at.

Prices for this grade ranged high and stimulated the planting of a great many acres of budded peaches, principally Muirs and Crawfords. As a great deal of the new acreage was in the form of small holdings and the fruit was harvested by the white owners a better grade of fruit began to be placed on the market. Prices for this fruit were also good, but the thousands of tons of low-grade China fruit which had been placed in consumption in the East at very high prices began to have its effect and the demand for dried peaches of any kind was seriously injured. This together with speculations by packers resulted in great fluctuations in the price of dried peaches during the late nineties and until 1911 and 1912 the growers received from 2½ cents to 12 cents a pound for the dried product or an average of about 6 cents per pound. As the high prices, however, generally obtained during years when crops were fairly light, growers did not make much more than operating expenses for a period of years.

These fluctuations in prices have resulted in orchards being neglected one year and cared for the following season when prices showed improvement, and as a consequence a great many orchards have been neglected to the extent that they have been permanently injured.

The low prices intimated in the opening paragraph as obtaining through the years of 1912–15 caused the planting of peach trees in Tehama County to cease almost completely, as in three years less than fifty acres of new peach trees were planted, growers devoting their lands exclusively to the planting of prunes and almonds. This has resulted in there being but few young orchards coming into bearing at this time and a very considerable acreage of the old neglected orchards being removed.

Cultivating and harvesting methods in this section are identical with those practiced elsewhere in the state. With a possible exception that large sheets are used to shake drying peaches on, instead of hand-picking them from ladders. The sheets protect the fruit from the ground and if the work is carefully done results in an equally high grade of fruit as would result if they were hand picked.

This article has confined itself chiefly to the discussion of drying peaches, as canning varieties are grown only to a very limited extent, as the distances from Tehama County points to the nearest canneries are too great to admit of profitable shipping. The past few years a very considerable tonnage of peaches has been shipped green to eastern points (by "green" is meant fresh peaches for shipment). The two varieties which have stood up to the test of time are Muirs for drying and Elbertas for shipping and drying, the Elbertas, in the writer's mind, being preferable to the Muirs for general planting inasmuch as they are inclined to make a larger grade of dried peaches than Muirs grown under the same conditions.

One of the most frequent questions asked a county horticultural commissioner is "which is the best variety of fruit to plant?" This question is almost always supplemented by a desire to know positively what the market will be on this particular variety when it comes into bearing some five or six years hence. In attempting to answer this question when applied to the planting of peaches it is the writer's plan to advise against the planting of additional peach acreage at the present time and until the demand and consumption of dried peaches is so thoroughly stabilized that a repetition of the past periods of low prices can not be repeated.

CONTROL OF CITRICOLA SCALE IN TULARE COUNTY.

By CHAS. F. COLLINS, County Horticultural Commissioner, Visalia, Cal.

Tulare County has 38,260 acres of citrus trees and the only insect pest of this vast acreage, of sufficient importance to call for control, is the citricola or gray scale. The first attempt at control work in this county was made in 1913, but owing probably to insufficient dosage of the chemicals used in fumigation, poor results were secured.

After a somewhat exhaustive series of experiments conducted by R. P. Cundiff of Riverside, in the early summer of 1914, commercial work was begun on July 23 and 1,200 acres were treated with excellent results in most cases. The pot system of fumigation was employed and sodium cyanide at a dosage of 1 ounce to 100 cubic feet of tent space was used until early in September, when this was increased 10 per cent. It was clearly demonstrated that with the humidity usually prevailing in Tulare County during the summer months, successful work could be done, with this dosage, at a temperature of 80 degrees or even higher under favorable conditions. Commercial work was continued until November 19, and early in December some experiments were conducted with a dosage of 1¼ ounces of sodium cyanide to 100 cubic feet of tent space, which resulted in an excellent kill of scale and no injury to tree or fruit.

The season of 1915 marked a new era in fumigation in Tulare County through the doing away of the old pot system and the adoption of the cyanofumer, eleven of which in connection with 600 tents were operated successfully. With the knowledge gained from the previous season's experience there was less hesitation about using big dosages at high temperatures, and 2,000 acres were treated with almost no damage and splendid results in all but two or three cases, where the comparatively poor kill could never be explained.

In 1916, work was begun on July 17, when the hatch was practically complete, most operators using the 110 schedule from the first, and continued until October 30, with a schedule of 120 in general use after September 1. Practically no damage resulted from the high dosages and a splendid kill of scale was effected. The time of exposure varies from 40 to 60 minutes, some growers insisting on the latter time. Personally, we believe that after 45 minutes, the loss in time is more than the gain in efficiency.

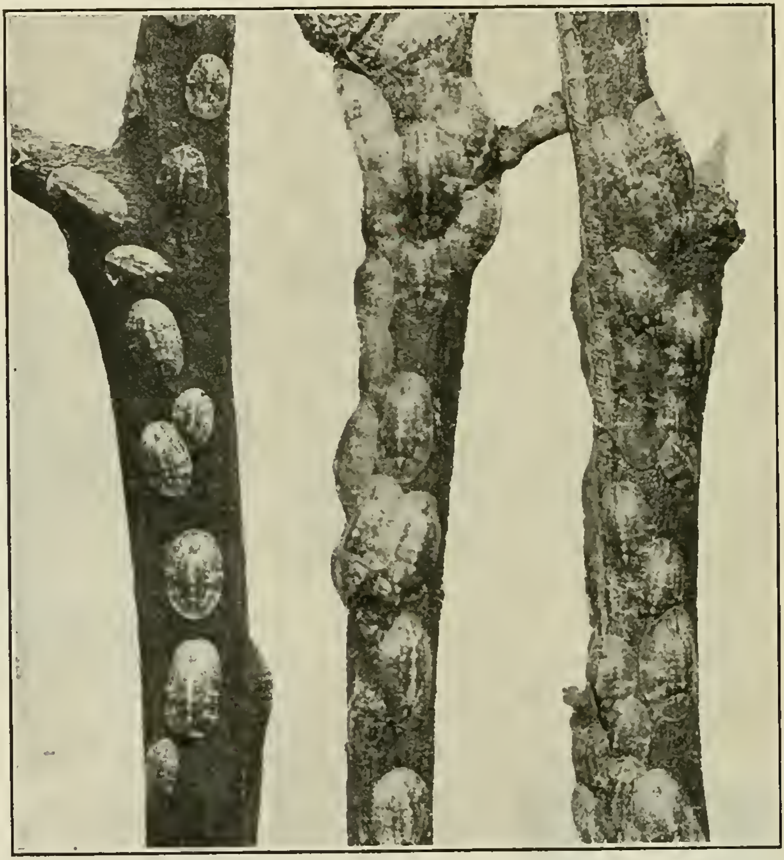

FIG. 145. The gray citrus scale, *Coccus citricola,* Campbell. Full grown female on orange twig. Enlarged three times. (After Essig.)

The present season opened on July 16 and soon after that date there were 750 tents in operation with twelve cyanofumers and two crews using the new liquid gas. Results with the latter, so far as examinations have been made, compare favorably with cyanofumer work, but it is yet too early to pass judgment.

Every crew is visited at least once each night by an inspector of this office, and as no one knows at what time he will appear, there is no doubt about this having a salutary effect upon the work in many cases, although in only one case has it been found necessary to resort to drastic measures with a fumigator. All tents must be plainly marked to indicate distance over, and taped to determine circumference and dosage required. All work, both fumigated and sprayed, is critically examined by a competent entomologist who devotes his entire time to this work for five months each year, and renders an exhaustive report to this office which gives us a very close check on the efficiency of each job as well as the work of each fumigator for the season.

The details of procedure in this work are as follows: The night inspector furnishes the investigator a report on each orchard, covering name of owner, fumigator, date of fumigation, acreage, variety, schedule used, time of exposure, number of tents, direction pulled, average temperature, and humidity. The first investigation is made not less than one month after treatment and a similar one not less than one month later, the result being based on an average of these investigations which is made in the following manner: The investigator takes sample leaves from each tree at the head of the orchard or the first tree shot in each row. These are placed in a sack. He then proceeds diagonally across the orchard to the opposite lower corner, taking samples from each tree passed. These are placed in a separate sack. Samples from each tree at the foot of the orchard or last one shot in each row are placed in still another sack. He then goes diagonally across to the point of starting and these samples are placed with those of the other diagonal row, and represent the main body of the orchard. The report on each orchard is thus rendered in three parts, namely: on the first tree shot in each row, on the main body, and on the last tree shot in each row. The result of each investigation is an average of these three reports which are secured by an actual count, under a glass, of all scale alive and dead. From this is figured the per cent efficiency of the work, although this of course does not determine the percentage killed by the treatment, as we have no way of knowing by what means the insect died. All samples are taken from the lower part of the tree. While this plan can not be followed in detail in all cases as where the tents are pulled in various directions or in irregular shaped orchards, we believe it is as near perfect as any practical method of investigation that can be devised.

The report for the season of 1916 shows an efficiency for each of the six fumigators ranging from 97 to 98.12 or an average of 97.65 for all work done. The spray work of which there was about 1,500 acres mostly with oil-sulfur, pyrox, and shure-kil sprays ranged from 50.3 to 87.86 efficiency so far as kill was concerned, but this does not take into consideration the very frequent and often serious damage done to tree or fruit of which there was practically none in the fumigation work.

We find that very often in spray work the bad results are not evident until the following year, when, as in the case of pyrox, there is frequently a more or less severe dying back of the smaller twigs. More disastrous results, however, have followed the use of this spray here through the destruction of the ladybird enemy of the cottony cushion scale, viz, *Vedalia cardinalis*. Death of this valuable predator is probably due to the arsenic contained in this spray. The cottony cushion scale has increased to an alarming degree, at times totally destroying the crop and even threatening the life of the trees in some orchards. Shure-kil proved such a "frost" that it was banished from the county after the second year.

A great many different kinds of sprays have been tried here for the control of gray scale, and in no case has the result justified the substitution of spray for fumigation in this work, the expense of the spray invariably being the greater when efficiency is considered. Very few growers spray the second season, but too many insist on being "stung" once.

From observation of results so far obtained in this county, this office can not recommend any spray for citricola scale except on very young trees or in isolated cases where for certain reasons fumigation is not practical.

THE CONTROL OF WALNUT APHIS
(*Chromaphis juglandicola*).

By A. A. BROCK, County Horticultural Commissioner, Santa Paula, Cal.

In recent years this aphid has evoked considerable comment and much experimental work has been done by investigators, with reference to possible injuries to trees and nuts from their attack. These injuries have caused great anxiety, and a desire for an effective and economical control measure. It would require considerable space to enumerate all of the deleterious effects theoretically attributed to this insect; however, it is an established fact that the physiological functions of trees are greatly impaired by the sticky excretions of this and other hemiptera.

In this county the infestations usually alternate, a heavy infestation being followed by a light one. In the summer and fall of 1913 the groves were severely attacked, all parts of the trees being covered with sooty mold fungus (*Eliola camelliæ.*) The loss accruing from this created a demand for an effective means of control. Before this time the pest had been considered of little importance by the walnut growers. Early in the spring of 1914 we sprayed a number of groves in an experimental way with a dormant spray of commercial lime-sulfur and quicklime, the latter being used as a marker. A few rows in several orchards were treated, leaving the remainder for a check. In a grove 31 years old we sprayed 33 trees with a 5 per cent solution of commercial lime-sulfur, 25 pounds of lime being added to each 200-gallon tank. It required a day and a half to thoroughly spray these trees, using M. A. C. nozzles, and the cost to the grower was $1.37 per tree. The following summer the infestation was very light throughout the walnut-growing section. A close watch was kept of the sprayed groves, but little difference could be noted in the sprayed and unsprayed trees, although the former were practically free from erinose, which is normally very abundant, though of little importance. In 1915 the infestation was quite serious again, while in 1916 it was severe only in a few scattered groves. No control measures were attempted during these years. In 1917 the infestations promised to be very severe early in the summer, creating alarm. We had kept close watch, and were prepared to start spraying as soon as conditions warranted treatment. Our first attempt was with nicotine sulfate and whale-oil soap at the rate of 1½ pints of tobacco extract and six pounds of whale-oil soap to two hundred gallons of water. The aphids were found to be dead very shortly after the application of this insecticide, it being almost impossible to find a live aphid on the sprayed trees. The grower for whom the work was done was so pleased with the results that he decided to spray thirty acres which were heavily infested. There were six hundred and thirty trees in this orchard, requiring six days to spray, at a cost of 34 cents per tree. After approximately half of the grove had been sprayed with 1½-6-200 formula, the strength was reduced to 1-4-200. No difference in results being noted, it was again reduced, this time to ½-4-200. The only difference observed was that the aphids were not killed as quickly as with the stronger solutions, though the final results were identical. Had the minimum strength been worked out before starting this spraying the cost of the work would have been reduced from 34 cents to 17 cents per tree. Other groves were sprayed with like results. Arrangements had been made to spray several other orchards, but the hot weather of June 14 to 17, inclusive, so destroyed the aphids that it was unnecessary. The heat also destroyed about 25 per cent of the walnut crop, the districts inland being damaged the most, some properties losing as much as 50 per cent of the crop. Another spray of nicotine sulfate and lime-sulfur has been tried out, but its use is not recommended because of the danger of severe burning if hot weather follows its application.

An attempt to control has been made here and elsewhere by applying tobacco dust and lime or sulfur as a carrier, with a large power dusting machine. This promises to be an effective and economic method of controlling the pest. Professor Ralph E. Smith, of the University of California, has had charge of this experimental work.

Predators had been relied upon for the control of this pest previous to 1914. The ones of greatest importance are *Olla abdominalis* and *Psyllobora taedata*. *Coccinella californica*, *Hippodamia convergens*, and *Hippodamia ambigua* are others of less importance. For some unknown reason the number of ashy grey ladybird beetles in this section has been dwindling, and the importance of the common red and black spotted ladybird beetle has been increasing. The status of the small ashy grey beetle has remained stationary. During some seasons the predators are present in sufficient numbers to completely check the aphid, and one possible explanation for the decrease in the number of ashy grey beetles is that they destroy so many aphids that there are not enough left for them to feed on the next year, and they must migrate or perish.

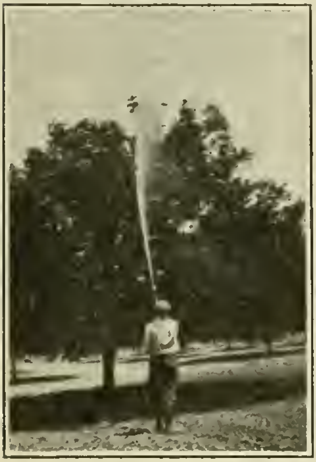

Fig. 146. Spraying for walnut aphis with M. A. C. Nozzle.

Early this season an entomogenous fungus was discovered destroying aphids in large numbers. A grove adjacent to the one first sprayed with nicotine sulphate was badly infested, but the work had been delayed on account of an inadequate supply of water. A later inspection disclosed a fungus belonging to the genus *Entomophthora*, which had so cleaned up the grove that treatment was unnecessary. The high humidity no doubt accounts for the rapid spread of this fungus. That conditions were ideal for the development and spread of such fungi is clearly shown by the fact that another fungus, *Entomophthora aphidis*, belonging to the same family, was found working on the destructive pea aphis, *Mocrosiphum pisi*. It destroyed the entire infestation in a short time.

An important fact brought out by our work on this aphid is that trees sprayed with nicotine sulphate are much less damaged by the hot weather than unsprayed trees. This can be accounted for by the fact that the sprayed trees put out a new growth which better protected the nuts. They were also free from sooty mold fungus, which remained on the leaves of trees where the pest had been controlled by such natural agencies as fungi, predators, and excessive heat. This is a great advantage of the liquid over the dust spray. The liquid spray not only relieves the trees of the attacking aphis, but also of the sticky excrement and sooty mold fungus resulting from their activities. Another great advantage of the summer spray over the dormant spray, aside from the reduced cost and greater efficiency, is that it need not be applied until it is evident that natural agencies will not control the pest; whereas the dormant spray must be applied annually, without knowledge of what future conditions will be.

The eggs of predators taken from the leaves of sprayed trees hatched into apparently healthy larvæ, which would indicate that the summer spray does not destroy the unhatched predators present.

Our advice to growers is to watch their groves, and when the infestation becomes severe enough to warrant treatment, spray with nicotine sulphate, unless there are strong indications of natural enemies developing in sufficient numbers to control the pest.

I believe that the summer sprays will in the very near future be generally used for the control of the walnut aphis, and if the conclusions drawn from our work here are correct, it will prove to be a very efficient and economical means of control.

ALMOND PRODUCTION IN YOLO COUNTY.

By WM. GOULD, County Horticultural Commissioner, Woodland, Cal.

There are 5,554 acres of bearing almonds and 3,285 acres of non-bearing almonds in Yolo County. There are several reasons why this county is important in the production of almonds. First and most important of all factors necessary for success is the climate. Being an early bloomer the almond requires a frostless region, and in this respect Yolo County has a decided advantage over many other places.

The almond requires a deep, sandy, well drained soil, of which Yolo County has thousands of acres. The nearness of markets, good roads, and cooperative almond growers' associations, are all advantageous.

Yolo County was awarded the Grand Prize at the Panama-Pacific International Exposition in 1915, for the largest and most meritorious display of almonds, and also a cash prize of $50 and first award at California State Fair in 1917.

There are about fifty varieties of almonds grown in this county, but the principal commercial varieties are Nonpareil, Drake Seedling, Texas Prolific, Ne Plus Ultra, I. X. L., Languedoc, Golden State, Jordan, Peerless and Eureka.

The cost of picking almonds is about $30 per ton. This work is done by means of light poles used to jar the nuts from the branches. The estimate of cost is for a light crop up to three-fourths ton per acre; with over three-fourths ton per acre production the cost would decrease. The cost of hulling by machine will average about $15 per ton.

The cost of trees (70 to an acre) including planting and cultivation for five years, will average about $75 per acre. Good almond land can be purchased in Yolo County for $75 per acre and up.

Some young almond orchards eight years old have produced one ton of almonds per acre per year. A one-fourth ton crop production will pay $40 to $50 an acre net.

The writer has talked with several almond growers in regard to the earnings and they say that their orchards have netted them $100 an acre for the last ten years; these orchards are not old trees either.

For domestic purposes the almond is highly esteemed, and is employed in many different ways in the preparation of appetizing dishes and dainties for the table. The oil of almonds is a common standard article in the stock of druggists everywhere, as it enters into the composition of cosmetic pastes and powders of various kinds.

The almond grower as well as other fruit growers has his troubles. The tree is host to several pests, the worst of all being the red spider and brown mite. The shot-hole fungus is a disease which does great harm if not kept in control. The most serious disease in my judgment is crown-gall. This disease affects the young trees principally and some nurserymen have lost as much as 80 per cent of their nursery stock on account of it.

Even though there are thousands of acres of almonds yet to come into bearing in California, the future never looked brighter for the grower. The Year Book of the U. S. Department of Agriculture states that the United States imported 16,596,921 pounds of almonds for the season of 1916.

OLIVE POSSIBILITIES IN YUBA COUNTY.

By G. W. HARNEY, County Horticultural Commissioner, Marysville, Cal.

There are at least fifteen thousand acres of land suitable for the culture of the olive in Yuba County. By suitable I mean land that has been tested, land that needs but little preparation for planting, and land that carries, from 30 to 75 feet beneath the surface, a stratum of water, from which may be economically pumped an abundant supply of water for required summer irrigation. Of the fifteen thousand acres, about twelve hundred acres are now planted to the olive in Yuba County, and of the twelve hundred acres, three hundred and fifty acres may be said to be in full bearing.

The Sierra (or San Joaquin) loam soils of Yuba County—red gravelly soils, well drained with an abundance of water for summer irrigation—have proven to be the ideal soils for the olive. The bearing orchards of Yuba County are planted on such soils and they are producing right along an average of three tons of fruit to the acre; in some seasons as high as four tons.

The first commercial orchards of Yuba County were planted some twenty-five years ago, and one 100-acre orchard planted about that time, pays at least 15 per cent net on a valuation of $1,000 per acre. This 100-acre orchard has gone through some vicissitudes, however. The trees were planted 24 feet apart, or 75 trees to the acre and are now becoming crowded and constant pruning is required to keep the grove open. If not kept thinned out, the inside rows especially mature the fruit late and in small sizes. Part of the grove was planted to a variety known as Nevadillo Blanco, the larger part to Missions. The Missions having done so much better in every way the Nevadillos were grafted over to the Mission variety.

Experience has proven that olive trees should be planted about forty feet apart each way. This distance gives room for the proper setting of the tree in its prime, gives plenty of sun and air in the groves, retards the forming of a humid atmosphere in the inner spaces, which is conducive to the growth of black scale and insures the early maturity of large-sized olives. Note that phrase "early maturity of large-sized olives." The fruit must be large, well colored and off the trees before the early fall frosts. Fall frosts may shrivel or crinkle the skin of the olive, making them unsuitable for the processed edible ripe olive and leaving the fruit in a condition useful for oil only. This is said to be the reason why the French and Italian groves can not turn out the edible ripe olive. They can not color and mature the fruit before the early fall frosts and are thus forced to process the olive in the uncolored or green state.

The Mission variety has proven the best for all purposes, as it contains a large percentage of oil, and has a delicious and nutty flavor which is entirely lacking in some varieties that produce a larger-sized fruit than the Mission. The Mission is more prolific. In the Smartsville district in Yuba County a variety producing a large fruit was tried out some years ago. The trees were shy bearers and did not make a good growth.

The planting of the olive in Yuba, taken up about twenty-five years ago as a commercial proposition, progressed slowly at first. Mistakes were made as to varieties; irrigation was considered unnecessary. Slight attention was given to cultivation and too much stress was laid on the fact that "the olive is a hardy tree." In recent years planting has been progressing more rapidly. Better matured nursery stock is being used—two and three year old trees are being planted—thirty to forty trees to the acre with an inter-row of prunes or shipping plums, on land properly graded for furrow irrigation. The prunes and shipping plums will mature in three or four years and produce dividends before the olives come in to profitable bearing. When the olive trees need the space the inter-rows of plums and prunes, having passed their more profitable days, can be entirely removed. It has been shown that from five to six years are required for the olive to produce to any extent.

Olive culture has undoubtedly passed the experimental stage and is based on a solid foundation as one of the best and surest of investments, but planters must heed the experience gained during the past 25 years. The requisites are good gravelly soil, sufficient drainage, plenty of water for summer irrigation, and fertilization to stimulate the growth of the trees and the development of the fruit, and above all the trees should be planted at the proper distance.

The most important feature of olive culture is the longevity of the trees. An olive grove is planted as a permanent proposition and will represent a permanent income, not only for the man who plants it, providing he does it right, but for future generations. As witness to this fact olive groves are found in Italy over seven hundred years old bearing fine crops year after year. Also at Santa Clara, San Diego and other old missions in California, trees over 105 years old are now bearing good crops of fruit. Furthermore, an olive grove can be considered as a monopolistic proposition, from the fact that in all of North America the olive can be grown only in California and in a small part of Arizona.

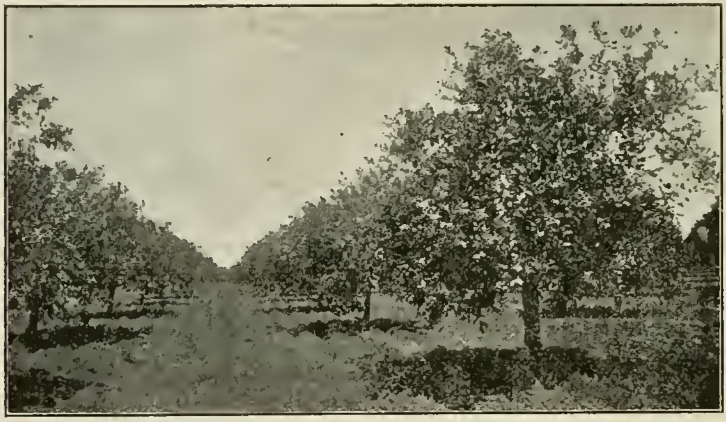

FIG. 147. One of the early olive plantings—still a good bearer.

The California ripe olive is a delicious, nutritious food; with bread it forms a perfect balanced ration. It has no competitor, having the United States and the world for a market. California olive oil is superior to the thin imported article. The olive business is established and is growing at a rate that insures that Yuba's fifteen thousand or more suitable acres will soon be planted. The needful things in the business today are close cooperation on the part of the growers, a standardization of olive products and a campaign for the education of the public as to the joys of consuming the ripe olive and olive oil.

QUARANTINE DIVISION.

REPORT FOR THE MONTHS OF AUGUST AND SEPTEMBER, 1917.

By FREDERICK MASKEW, Chief Deputy Quarantine Officer, San Francisco, California.

SAN FRANCISCO STATION.

Steamship and baggage inspection:

Ships inspected	145
Passengers arriving from fruit-fly ports	7,553

Horticultural imports:

	Parcels
Passed as free from pests	165,379
Fumigated	7,729
Sterilized with steam	28
Refused admittance	127
Contraband destroyed	41
Total parcels horticultural imports for the two months	173,304

Pests Intercepted.

From Australia:

Eulecanium corni and mites on gooseberry plants.

From China:

Cylas formicarius in sweet potatoes.
Fungus on oranges.

From Guatemala:

Ceraputo sp. and Hemiptera on orchids.

From Hawaii:

Coccus longulus on betel leaves.
Diaspis bromeliæ and *Pseudococcus bromeliæ* on pineapples.
Trypetid larvæ in decayed peach.
Trypetid larvæ in cucumbers.
Weevils in seed pods.

From India:

Pseudococcus sp. on pomelos.

From Japan:

Aulacaspis pentagona on cherry tree.
Lepidopterous larvæ in beans and dried figs.
Pseudaonidia duplex on camellia.
Weevils in dry herbs and roots.
Larvæ of Weevil in sweet potatoes.

From Java:

Calandra oryzæ in rice.
Pseudococcus sp. on pomelo (fruit).

From Pago Pago:

Coccid and Fungus on oranges.

From Nicaragua:

Spermophagus pectoralis in beans.

From Tahiti:

Fungus on oranges.
Larvæ of borers in dry citrus wood.

LOS ANGELES STATION.

Ships inspected	57

Horticultural imports:

	Parcels
Passed as free from pests	67,322
Fumigated	4
Refused admittance	21
Contraband destroyed	11
Total parcels horticultural imports for the two months	67,358

Pests Intercepted.

From Arizona:

Chlorida obsoleta on corn.

From Central America:

Aspidiotus cyanophylli on bananas.

From Colombia:

Diaspis boisduvalii and *Chrysomphalus perseæ* on orchids.
Isosoma orchidearum on orchids.

From Louisiana:

Lepidopterous larvæ on vines.

From Mexico:

Coleopterous larvæ in coquita nuts.

From New York:

Diaspis boisduvalii on orchids.
Eucalymnatus tessellatus on orchids.

From Washington:

Venturia inequalis on apples.

SAN DIEGO STATION.

Steamship and baggage inspection:

Ships inspected	36
Fish boats inspected	63
Passengers arriving from fruit-fly ports	148

Horticultural imports:

	Parcels
Passed as free from pests	2,993¼
Fumigated	2
Refused admittance	1¾
Contraband destroyed	7
Total parcels horticultural imports for the two months	3,004

Pests Intercepted.

From Florida:

Hemichionaspis aspidistræ on ornamental plants.

From Louisiana:

Lepidosaphes ulmi on apples.
Aspidiotus cyanophylli on bananas.

From New York:

Pseudococcus sp. on crotons and other ornamental plants.

From Oregon:

Codling moth in pears.

EUREKA STATION.

Steamship and baggage inspection:

Ships inspected	14

Horticultural imports:

	Parcels
Passed as free from pests:	2

SANTA BARBARA STATION.

(No report.)

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